Lake Erie Fisheries Assessment Unit
Report 1989-2

ESTIMATED INCIDENTAL CATCHES OF SMALLMOUTH BASS IN COMMERCIAL GILL NETS, LONG POINT BAY, LAKE ERIE, 1988.

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EXECUTIVE SUMMARY

1. Incidental catches of smallmouth bass in commercial gill nets were investigated for the late April-October period of 1988 in Long Point Bay. Emphasis was placed on waters east of Port Dover in response to findings of the studies conducted in 1987 (MacGregor, 1988). Two approaches were again taken:

   (a) examinations of seasonal and temporal trends in incidental smallmouth bass catches were carried in waters east of Port Dover by means of simulated commercial fishing, and

   (b) on-board observations were made of actual commercial fishing catches throughout Long Point Bay.

2. The critical period of vulnerability for waters east of Port Dover was determined to be between July 1 and September 30; however, because of changes in the study design in late June, the spring results are not strictly comparable to data collected from late June - October.

3. The entire incidental catch of bass in Long Point Bay was estimated to be 7,594 ± 3,025 bass in 1988. Of these, 74% were taken in waters east of Port Dover. We estimated that almost twice as many bass were captured in waters east of Port Dover than in waters west of Port Dover. The total incidental catch in 1988 represents a 34% reduction over that estimated for 1987 (11,414 bass).

4. Reported commercial gillnet effort in Long Point Bay was reduced again in 1988; the 1988 effort represents only 24% of the average effort reported for the 1978-1986 period. Effort in 1988 declined by 37% over that reported for 1987; this reduction in effort explains the reduced incidental catch in 1988.

5. Inspection of spatial trends in incidental catches east of Port Dover suggest that bass concentrate in rocky areas near to and west of Peacock Point, and at Nanticoke Shoal where structure abounds and provides excellent bass habitat.

6. Tagging studies in 1988 confirmed that bass do travel from waters east of Port Dover to the Inner Bay during the spawning season. These bass from Nanticoke waters contribute to the important sport fishery of the Inner Bay.

7. Incidental catches may be reduced in waters east of Port Dover by reducing or eliminating gill netting at times and in areas where bass are most vulnerable. The critical period and significant areas of vulnerability have been tentatively identified for these waters but some further work is required to verify the 1988 findings.

8. Angler success rates improved for bass in 1988, CUE's increased by 20% (from 0.441 in 1987 to 0.536 in 1988).

9. Smallmouth bass can survive entanglement in gill nets; particularly if they are removed and released immediately after the nets come on board. Our work in 1988 suggests that perhaps 37% of the bass entangled in commercial nets would survive if all bass were removed at the puller.

10. The following additional work is recommended to round out our understanding of the incidental catch issue, improve our understanding of the bass population in Long Point Bay and to monitor any corrective management actions taken to reduce the incidental catch:

(a) Simulated commercial fishing in waters east of Port Dover should be repeated from spring through fall to confirm the critical period of vulnerability in these waters.

(b) The tagging program initiated in 1988 should be followed through in 1989 to collect more data concerning bass movements within the bay. Of particular use would be an emphasis on post-spawning movements from the Inner Bay.

(c) As our biological information concerning trends in the bass population (size, structure, mortality, growth, etc.) are inadequate, an index fishing program which targets

on the bass populations should be implemented. However, a long-term commitment to this program is required for it to be of any value to managers.

(d) Our studies of incidental catch (and the resulting management actions) have strong implications for fisheries management issues in many other waters of Ontario; therefore, any management actions should be monitored carefully in terms of:

(i) compliance

(ii) effects on the incidental catch and on the bass populations, and

(iii) effects on the sport and commercial fisheries.

1.0 INTRODUCTION

In 1983 and 1984, the Ontario Ministry of Natural Resources carried out some preliminary work in Long Point Bay concerning incidental catches of smallmouth bass (Micropterus dolomieu) in commercial gill net (MacGregor 1987). More detailed investigations in 1987 (MacGregor 1988) estimated that 11,414 bass were caught accidentally in smallmesh commercial gill nets during the 1987 fishing season (May-October). Bass were found to be most vulnerable to gill nets between July 1 and September 30 in waters west of Port Dover; however, some 66% of the total catch came from waters east of Port Dover and we lacked information concerning seasonal and spatial distribution of catches in this area.

As 1987 was the first year in which we were able to estimate the incidental catch from the entire bay (and the first year of data from waters east of Port Dover) it was recommended that an additional years work be carried out to:

(a) provide a second estimate of bass catches from the entire bay,

(b) provide a more intense examination of bass catches in waters east of Port Dover (i.e., attempt to define the critical period of vulnerability in this area and locate "hot spots" in the area where bass catches are highest),

(c) undertake a tagging program which focused on seasonal movements of bass within the bay, and

(d) begin a more prolonged examination of potential survival rates of bass from entanglement.

This report summarizes the findings of our 1988 investigations.

2.0 METHODS

2.1 GENERAL APPROACH

Two main field approaches were undertaken to collect the required data in 1988. The first approach involved conducting simulated commercial fishing exercises similar to those carried out in 1987 (MacGregor 1988). However, for the first time, this program was carried out in waters east of Port Dover (Area 3, Figure 1). The simulated fishing program provided data concerning the seasonal and spatial distributions of bass catches.

The second approach consisted of a series of on-board observations of actual commercial gill net catches throughout the bay between May 10 and October 6. This program provided the data necessary to calculate the catches of bass per unit of commercial effort (CUE: catch of bass/km of net).

2.2 SIMULATED COMMERCIAL FISHING

Waters east of Port Dover were far more complex in terms of bottom topography than those west of Port Dover. For this reason, our simulated fishing exercises here were somewhat experimental through May and June. It was not until July that we established a firm design for the remainder of the project.

A. Grid Fishing

In May and June we attempted to choose locations and stratify our distribution of effort in these waters based on patterns of effort used by commercial fishermen in the 1987 fishing season. This was

accomplished by first dividing waters east of Port Dover into grids (Figure 2) and then separating those grids that were fished once, from those fished more than once by the commercial fishermen accompanied in our 1987 on-board survey (MacGregor 1988). For navigational convenience, Area 3 was also divided into two subsections (Section I, Section II, Figure 2). Each section was fished once per week at four stations. The stations were selected by randomly choosing grids from the section in the proportion of 3 shaded to 1 unshaded on Figure 2. Lat-Long coordinates were determined on a 1:50,000 nautical chart of Long Point Bay and subsequently located in the field by means of LORAN-C (King Model 8001). In this design we hoped to generate a bass CUE representative of what the commercial fishery may have experienced. This initial design was chosen because we were not certain that the on-board sampling program would be possible in 1988. However, at the last minute, we were able to implement the program. Also, it became apparent that our attempts to simulate effort distribution of the fishery would be inaccurate because commercial fishing practices changed substantially in 1988.

B. Transect Fishing

For the reasons indicated in 2.1(A), the design of the simulated fishing program was altered (beginning June 21) to a design similar to those used in previous years (MacGregor 1987, 1988). A series of 11 equally spaced transects (Transects 1-11) were established on a nautical chart of Long Point Bay. Sampling sites were established along the transects at points where each transect crossed the 2-m, 6-m and 9-m depth contours (coded A, B and C respectively); a fourth sampling site (D) was established at a point 1 km further offshore from the

station on the 9-m contour (Figure 3). Thus, each transect (or station group) consisted of 4 stations. We also established two transects (12 and 13) along a reef area extending southwest from Peacock Point; a final group of 4 sites (14) was established surrounding Nanticoke Shoal. Sampling sites in groups 12, 13 and 14 were coded A, B, C or D depending on the depth of the individual sites (if more than one station in these groups occurred on the same depth contour, they were subcoded as A_1, A_2 .. or B_1 , B_2... and so on).

In the final design, eight sites (2 station groups or transects) were selected randomly for each week; four sites (one transect) were sampled on one day of a given week, the remaining transect being sampled on the second day of the week. The lat-long coordinates of each sampling site were taken from a 1:50,000 nautical chart of Long Point Bay; these coordinates were located in the field by means of LORAN-C. One strap of gill net, consisting of 2 1/4" stretched mesh monofilament throughout, was set at each sampling site from our 42 foot vessel, the RONNIE D. Initially, each strap was 1 km in length and 15 meshes deep. However, because yellow perch catches were exceedingly high in 1988, we reduced the length of each strap to 768 m beginning on May 27; nets were further reduced in length to 585 m beginning on September 7, 1988. Nets were set one day and lifted the next, weather permitting. The sampling schedule is summarized in Appendix Table I. All fish harvested at each sampling site were sorted according to species, counted, and weighed in bulk to the nearest 0.1 kg (Chattilon Hanging Autopsy Scale Model 815A) on board. Smallmouth bass were either sampled on board (lengths (mm), weight (g) and scale sample),

tagged with a jaw tag (Salt Lake Stamp Co., No. 84FC4) and released alive; or they were returned to our laboratory in Port Dover where lengths (mm), weight (nearest 0.1 g) and sex were determined. In both instances, scales were taken from the left side of each bass near the tip of the pectoral fin when depressed. Scale age was determined using January 1 as the birth date.

2.3 ESTIMATED SURVIVAL FROM ENTANGLEMENT

The potential for smallmouth bass to survive entanglement in gill nets was investigated during simulated fishing as follows:

(i) Smallmouth bass entangled in each strap of gill net were removed either (a) at the puller, or (b) after the nets were overhauled and picked. The numbers of live and dead (no visible movement) bass were counted and summarized according to the two treatments.

(ii) Live smallmouth bass (usually no more than the first 10) removed from the nets were placed in live tanks aboard our vessel. These bass were separated according to whether they were removed at the puller, or removed after the nets were overhauled. These bass were held in live tanks at our Port Dover station for up to 5 days. Survival in the tanks was assessed daily; data were again summarized according to the two treatments.

2.4 ON-BOARD OBSERVATIONS

Between May 10 and October 6, 1988, OMNR staff accompanied commercial fishermen during 48 separate fishing occasions. Whenever possible arrangements were made no more than one day in advance of lifting their nets, after the fishermen had set his nets and returned to port. While 5 fishermen eventually refused to allow our staff on-board, cooperation was generally good. The sampling schedule for this survey is outlined in Tables 3 and 4.

On those days when OMNR staff accompanied a fisherman, the following information was recorded:

(i) the coordinates at the ends of each gillnet strap using the fisherman's LORAN-C.

(ii) the number of smallmouth bass caught in each strap,

(iii) the length of net in each strap (reported by the fisherman,

(iv) whether the bass were removed at the puller, or after the nets were overhauled, and

(v) the weight of yellow perch harvested for the entire day (i.e., summed over all straps); this was obtained from the fisherman's visual estimate and by subsequent verification on the appropriate Daily Catch Report (DCR) turned in to the OMNR.

Once again, we excluded all data derived from straps that were canned, or that contained twine larger than 3" stretched mesh.

In general, an attempt was made to sample (lengths, weight and scales) most bass that were caught by commercial fishermen. In many instances, bass were sampled on-board, tagged with a jaw tag and released. Dead bass were returned and sampled at our Port Dover laboratory.

The amount of effort represented by each strap of commercial gill net (i.e., the length of net) was first approximated by asking the fishermen and recording that information. This information was subsequently verified (a) by checking the information reported on the appropriate DCR, and (b) by plotting each strap of net on a 1:50,000 nautical chart using the LORAN-C coordinates obtained at the ends of each strap; actual lengths were then calculated by scaling (plotted

effort). When large discrepancies occurred, we accepted the "plotted effort" as the best approximation to the actual effort used.

2.5 TAGGING PROGRAM

Because there were some questions regarding the importance of bass in waters east of Port Dover to the sport fishery, we implemented a tagging program in 1988 designed to examine movement patterns of bass within Long Point Bay.

Bass were captured using a variety of gear including trap nets, fyke nets, angling and gill nets. Four trap nets were set in outer Long Point Bay, and 3 hoop nets were set in the Inner Bay (Figure 4); these nets were set on April 14 and removed by July 1, 1988. While trap nets and hoop nets were our preferred method of capturing bass (because they impart minimal stress), we found that bass catches were sparse in this gear. Largemesh (>3.0-in) gill net was found to be much more efficient in capturing bass than were trap nets; therefore, we used this gear near the heated water outfall of the Nanticoke Thermal Generating Station (NTGS) to increase our catches. Bass are known to concentrate in this area at certain times of the year (MacGregor and Witzel, 1988). In addition, we tagged live bass from all other components of our program as we encountered them. Most bass were tagged by affixing numbered circular metal jaw tags (Salt Lake Stamp Co., No. 84FC4) to their lower mandible. However, we also used numbered floy tags as described in MacGregor and Witzel (1988). Rewards were offered for each bass or tag returned; in addition, each bass returned was treated as an entry for a draw prize at the end of the year (see Appendix Figure I).

2.6 DATA ANALYSES

Data summaries were performed on our IBM-AT microcomputer using SAS statistical packages (Anonymous, 1982). Catches per unit of gillnet effort (CUE) were calculated as the number or weight (kg) of a given species per kilometer of net.

As in past studies (MacGregor 1988), the total incidental catch of smallmouth bass in commercial gill net was estimated by expanding the catches of bass per unit of effort (catch/km) calculated in our on-board survey, to the total effort reported by all fishermen over the period, and within areas of concern. All figures relating to total effort expended by the commercial gillnet fishery (the expansion factors) were derived from computer summaries of the DCR (Daily Catch Report) data base for Lake Erie.

Estimates of total annual bass catches by the commercial fishery were derived by first identifying the period of vulnerability using data from our simulated fishing exercises. Next, the catch of bass/km of commercial gill net (CUE) was calculated for this period within the area(s) in question. Finally, these CUE's were then expanded to the total effort figure derived from the DCR data base for the area(s) and period in question.

3.0 RESULTS

3.1 SIMULATED COMMERCIAL FISHING

In the 39 nights of simulated commercial fishing (representing 152 individual sets) the catches from 115.275 kilometers of gill net were examined. The total catch consisted of 84,373 fish (9,772 kg) representing 26 species (Table 1). Yellow perch, the target species, was the most abundant species in the catch, and represented 55.1% of the catch by number, or 58.8% by weight. White perch (Morone americana) was the next most abundant species, and represented 33.7% of the catch by number (27.6% by weight). A total of 1240 (183 kg) smallmouth bass were captured during the survey period, these represented 1.5% of the total catch by number (1.7% by weight), and represented 2.7% of the total catch of the target species by number (3.2% by weight).

Bass were captured in small numbers throughout the spring period (Apppendix Table I); however, when data were pooled over all locations examined between May 3 and June 30, bass catches averaged only 1.8 bass per km of gill net. Beginning in July, catches of bass increased rapidly and persisted at higher levels through September (Figure 5). Between July 1 and September 30, bass catches averaged 18.5 bass per km of net, but declined to a pooled average of 4.3 bass per km in October (recognize that catches were highest in the first week of October and declined thereafter; Figure 5). Some 92.1% of the bass were age 2 or 3 (36.8% age 2, 55.3% age 3).

Over the entire survey area and period (May 3 - November 3, 1988), smallmouth bass catches averaged 10.8 bass per km of net. Bass catch-

es typically were higher along the two shallowest depth contours (Lines A and B, Figure 6) in June and July, but this relationship was not consistent over the entire survey period. In fact, bass catches were highest along the deeper contours later in the year (Figure 6). Therefore, no clear "average" relationship between depth and bass catches could be ascertained for the July - September period (the period when bass catches are highest). In June, July and August, yellow perch catches were slightly higher in shallower waters (Lines A and/or B); but, catches increased with depth in September and October (Figure 7). Catches of smallmouth bass varied considerably over time and among locations. In general, bass CUE's were highest between the beginning of July and end of September (Figure 5), and catches tended to be highest in reef areas, particularly near Peacock Point and at Nanticoke Shoal (Figures 3, 8).

3.2 ESTIMATED SURVIVAL FROM ENTANGLEMENT

During 32 occasions when the numbers of live and dead bass were counted at the puller, an average of 65.9% of the bass were alive. On the other hand, during 31 occasions when the number of live entangled bass were not established until after the nets were on board, overhauled and picked, only 19.0% remained alive (Table 2).

In spring months (May - June) there was very little difference in the percent of bass alive at puller vs those alive after nets were overhauled (86% and 85.2% respectively). However, during the warmer months (July - September) this difference was pronounced (62% alive at the puller vs 13.6% alive after nets were overhauled). Under the cooler conditions of October and early November the difference between

the two treatments was minimal (97.1% alive at puller vs 93.8% after nets were overhauled) (Table 2). Longterm survival of bass removed from gill nets was examined by holding these bass in live tanks for 5 days. Under these conditions, 55.6% of the live bass removed at the puller survived the holding period, while 48.7% of the live bass removed after nets were overhauled survived. Survival was highest in the spring and fall months, (approximately 81-95%), and lowest in summer months (44-46%).

3.3 ON-BOARD OBSERVATIONS

OMNR staff accompanied commercial perch fishermen on 48 separate fishing trips, 26 of these trips occurred exclusively in Areas 1 and/or 2, while 20 trips occurred exclusively in Area 3 (Tables 3, 4).

All straps of net examined were plotted according to LORAN-C coordinates collected in the field and are shown in Appendix Figures II - V. Two trips occurred both in Areas 1 - 2 and in Area 3 on the same day, but we were able to split the catch-effort data from these trips into the appropriate Areas.

In total, we inspected the catches from 116.931 km of gill net (61.194 km in Areas 1 and 2; 55.737 km in Area 3). Some 109,598 yellow perch (12,872 kg) were harvested by these fishermen, and 532 (81.1 kg) smallmouth bass were captured accidentally in these nets (Tables 3, 4). Only two bass were observed in commercial nets prior to July and virtually all bass were captured in commercial nets between the months of July and September. However, only two vessels were inspected in

October (commercial fishing effort was negligible in this month). Some 91.2% of the bass were age 2 or 3 (53.6% age 2, 37.6% age 3). Most (279) bass were captured in Area 3 where the July-September CUE averaged 11.0 fish/km of net; in contrast, the July-September CUE in Areas 1-2 averaged only 7.6 bass/km. The pooled July-September CUE for all areas was 9.1 bass/km of commercial gill net (Tables 3, 4). When data were pooled from all areas over the July-September period, regression analyses revealed that CUE's of bass declined with depth of set. The relationship was weak but significant in the form of:

$$CUE = -0.954\ (DEPTH) + 16.8 \qquad r = -0.25,\ P<0.0418$$

3.4 ESTIMATED CATCHES

Results of simulated commercial fishing and examinations of seasonal bass catches in commercial gear suggest that bass are most vulnerable to smallmesh commercial gill nets from July through September (Figure 5, Tables 3, 4). Therefore, in estimating the total catch of smallmouth bass by commercial fishermen using smallmesh gill nets, it was assumed that catches of bass were zero (0) before July 1 and after September 30 (i.e., it was assumed that the total annual catch of bass in commercial nets would occur during the critical period of July 1 - September 30).

Analyses of total reported commercial effort over the past four years (1985 - 1988) on the Daily Catch Reports revealed a further decline in the July-September fishing effort in 1988. Reported commercial effort in these months represented only 43% of that reported for the same period in 1987 (Figure 9) (recall that effort was atypically low in

1987 in comparison with earlier years; MacGregor 1988).

Using the ratio estimates of Snedecor and Cochrane (1980), expansions of smallmouth bass CUE's to the total reported effort (km of gill net) resulted in the following estimated catches (and 95% confidence intervals) of smallmouth bass during the July-September period of 1988 (1987 data are included for comparison):

Areas 1 and 2

EFFORT YEAR	CUE	EFFORT (KM)	ESTIMATED CATCH
1988	7.6	339.9	2583 ± 1116
1987	7.0	549.3	3823 ± 1702

Area 3

EFFORT YEAR	CUE	EFFORT (KM)	ESTIMATED CATCH
1988	11.5	485.5	5584 ± 3863
1987	9.8	755.0	7490 ± 2880

Areas Combined

EFFORT YEAR	CUE	EFFORT (km)	ESTIMATED CATCH
1988	9.2	825.4	7594 ± 3025
1987	8.8	1304.3	11414 ± 3678

Sample calculations are provided in Appendix Table II to indicate how the estimates were derived.

3.5 ESTIMATED KILLS DUE TO ENTANGLEMENT

The estimated catches in Section 3.4 do not necessarily represent complete kills because some bass may survive if released. The survival depends on how bass are handled prior to release (see Section 3.2). The following mortality rates were considered in our 1988 attempts to estimate gillnet kills:

(A) 100% Mortality Due to Entanglement

This scenario suggests that all bass captured in gill nets eventually die as a result of entanglement.

(B) 91% Mortality Due to Entanglement

On-board observations of commercial fishing revealed that the great majority of the fishermen waited until the nets were overhauled before removing the bass. Thus, the mortality rate of bass handled under prevailing fishing practises was estimated by making the following assumptions:

(i) All bass are removed by commercial fishermen after nets are overhauled.

(ii) All live bass are released immediately into the lake (rather than placing them in a junk box first).

(iii) The percent of bass remaining alive after the nets are overhauled is 19% (derived from simulated commercial fishing, Section 3.2).

(iv) The longterm survival rate of bass released is 49% (Section 3.2).

Under these assumptions, the survival rate of bass removed under the prevailing handling methods of commercial fishermen would be approximately:

(19% alive) x (49% longterm survival) = 9.3%

Therefore, the mortality rate would be about 91%.

(C) 63% Mortality Due to Entanglement

If all fishermen were to remove all entangled bass at the puller and release them immediately, it follows from Section 3.2 that the survival of bass could be increased to:

(66 % alive) x (56% longterm survival) = 37%

Therefore, the mortality rate under this scenario would be reduced to 63%.

The above 3 mortality rates yield the following estimated kills under effort levels prevailing in 1988 or 1987:

EFFORT YEAR	ESTIMATED SMALLMOUTH BASS KILLS UNDER 3 DIFFERENT MORTALITY RATES		
	100%	91%	63%
1988	7,594	6,911	4,784
1987	11,414	10,387	7,191

It must be emphasized that the 3 mortality regimes presented above represent 2 approximations (100%, 91%) to what true conditions may be under present conditions, and one approximation of what mortality might be reduced to if bass were handled carefully. As we do not know what true conditions are, little emphasis should be placed on the actual mortality rates; rather, the important pieces of information derived from the results are:

(1) that some bass can survive entanglement in gill nets, and

(2) that the chances of survival from entanglement can be improved substantially (perhaps by as much as 30-40%) if the bass are removed and released immediately (i.e., as soon as the nets come on-board).

3.6 ESTIMATED KILLS DUE TO ANGLING

Creel surveys carried out annually between 1978 and 1988 (Table 5) suggest that, on average, an estimated 55,524 bass are harvested per year by anglers. In general, success rates by smallmouth bass anglers in Long Point Bay have increased over the 1978-1988 period. Angler success rates improved again in 1988 to reach an observed CUE of 0.536 bass per rod hour (Table 5).

3.7 MOVEMENT PATTERNS

In total, we tagged and released 816 smallmouth bass which averaged 263.7 mm in fork length and 3.9 years old. Of these, 577 were captured in MNR gill nets, 122 in hoop nets, 62 in commercial gill nets, and 46 by angling. In 1988, 43 bass were recaptured; of these, 24 (or

53%) had been initially captured, tagged and released from gill nets (21 from MNR nets, 3 from commercial nets), while 12 had been initially captured in hoop nets. Most (88%) recaptures were made by anglers, 33 of which were recaptured in the months of June and July (note that all June recaptures occurred on opening weekend of bass season, June 25). The recaptured bass averaged 302.2 mm in fork length and 4.9 years old.

There was a pronounced tendency for bass to move from waters East of Port Dover to the Inner Bay during spawning season; this tendency is aptly illustrated in Figures 10 and 11. During the spawning period (late May - end of June) bass tagged and released within the Inner Bay tended to remain there (Figure 12).

4.0 DISCUSSION

4.1 ESTIMATED CATCHES FOR 1988 AND COMPARISONS WITH 1987

During our 1987 investigations, smallmouth bass were found to be most vulnerable to commercial gill net between July 1 and September 30 in waters west of Port Dover (Areas 1 and 2); this was termed the critical period of vulnerability (MacGregor, 1988). The results of simulated fishing in waters east of Port Dover (Area 3) during 1988 suggest that the critical period is the same in these waters. However, because we changed the design of the simulated fishing program in June (see Section 2.2), the results from this program before and after June 21 are not strictly comparable. Additional field work is required in 1989 to confirm the period of vulnerability.

Considering the data at hand (and the findings of the 1987 study), we assumed that the critical period of vulnerability was again July 1 - September 30. In other words, we assumed that the catch of bass in smallmesh commercial gill net is zero before July 1 and after September 30 in all waters of Long Point Bay. Clearly a few bass will be caught in gill nets outside this period, but the catches at these times would appear to be negligible, and hence have minimal impact on the total estimate of bass captured.

Based on these assumptions, the estimated number of smallmouth bass caught in gill nets during 1988 was 7594 bass. This represents a decline in the incidental catch by some 34% over that estimated for 1987. Commercial fishing practices have changed in recent years. Total smallmesh commercial gillnet effort within Long Point Bay has

declined sharply since 1986 (Figure 13). Past commercial effort levels within Long Point Bay averaged 2812 km between 1978 and 1986 during the critical period (July-September); however, effort in 1987 declined to 46% of the 1978-86 average, and 1988 effort represented only 29% of the earlier levels (1978-86). Reasons for the decline in effort are unclear, but apparently are related to the fact that commercial perch and walleye catches have been far better in the Central Basin recently; thus, many commercial fishermen who traditionally fished within Long Point Bay have found it economical to fish more frequently in the Central Basin. As MacGregor (1988) pointed out "...the level of commercial gillnet effort prevailing in Long Point Bay will very strongly dictate the total catch [of smallmouth bass]...". In Section 3.5 of this report it is noted that while the estimated catch of smallmouth bass declined sharply from 1987 to 1988 (by 34%), the CUE's (i.e. catches of bass/km of commercial gill net) during the critical period did not; in fact, they remained the same (or even increased slightly). Over the same time period, total commercial effort declined by 37%. Clearly, the principal factor leading to the reduced incidental bass catches in 1988 was the strong reduction in total commercial effort.

Results of simulated commercial fishing in 1987 in waters west of Port Dover suggested that bass CUE's declined sharply when fishing 1 km further offshore from the Fishing Reserve Boundary (MacGregor 1988). In 1988, OMNR took an exploratory step to reduce the encounters of bass with commercial gill nets. From July 1 to August 31, 1988 commercial fishing was restricted to waters 1.6 miles offshore in Area 1; this applied only to that portion of the Fishing Reserve Boundary

known locally as the "one-mile line" (Figure 14). Our on-board sampling program in 1988 indicates that this "fishing gear prohibition order" was complied with by the industry (Appendix Figures II-IV). The change in the distribution of commercial effort is clear when Appendix Figures II-IX of MacGregor (1988) are compared to Appendix Figures II-IV of this report.

This management action was intended to restrict fishing to waters where bass densities (or at least vulnerability) were reduced. If the size and behavior of the vulnerable portion of the bass population remained the same in 1988 as it was in 1987, then we would have expected to see a reduced bass CUE in 1988 in commercial gill nets. That CUE's did not decline suggests that:

(i) the management action was ineffective, and/or

(ii) the size and/or vulnerability of the catchable (by gill nets) segment of the bass population increased.

We may never know the answer to scenario (i) and our information concerning the biology of the bass populations in Long Point Bay is extremely sparse; currently, no monitoring is directed toward the bass population beyond an annual creel census of the sport fishery. Information derived from a creel census program can be misleading when attempting to interpret trends in population abundance (see Shuter et al 1987). However, if the trends in angler success do reflect trends in the bass population, then it would appear that the catchable (by anglers) segment of the bass population increased in 1988. Angler CUE's increased from 0.441 in 1987 to 0.536 in 1988 (an increase of over 21%). Therefore, if the bass population increased, we would have

expected proportionately higher bass CUE's in commercial gill nets had they been allowed to fish along the one-mile line during the critical period. As no comparative fishing was carried out in waters west of Port Dover, we cannot test this hypothesis. However, it is clear that no change in commercial gillnet CUE's between 1987 and 1988 does not mean the management action of moving the line offshore was ineffective; rather, it may mean that catches would have been considerably higher in 1988 (because of the larger bass population) had fishermen been allowed to fish the 1-mile line in 1988.

4.2 WATERS EAST OF PORT DOVER

Once again we observed that catches of bass per km of commercial gill net were 34% higher in Area 3 than in Areas 1 and 2 combined. In 1988, we estimated that almost twice as many bass were caught in waters east of Port Dover (5584 bass) than in waters west of Port Dover (2583 bass); this was due to the high CUE in Area 3, combined with the higher effort exerted in these waters in 1988 (relative to that exerted in waters west of Port Dover). Thus, in 1988, waters east of Port Dover accounted for 74% of the estimated incidental catch. Similarly, these waters accounted for 66% of the incidental catch estimated for 1987 (see Section 3.5). It is only because effort was higher in 1987 that more bass (7490) were caught east of Port Dover in 1987, than in 1988 (5584 bass).

The 1987 and 1988 studies were <u>not</u> designed to provide estimated bass catches at levels of resolution below the two major survey areas (waters west of Port Dover - Areas 1 and 2; and waters east of Port Dover - Area 3). Within Area 3, the highest bass CUE's during simu-

lated commercial fishing occurred at Nanticoke Shoal (46.0 bass/km) and in Grid 96 of Figure 1 (25.4 bass/km). In contrast, bass catches averaged only 9.6 bass/km in the remaining waters surveyed in 1988. Apparently, within Area 3, bass are most concentrated in waters adjacent to (and west of) Peacock Point, and also in waters surrounding Nanticoke Shoal. Diving studies carried out during other components of our program confirm that large schools of bass inhabit these rocky areas where structure abounds and provides good habitat for this species.

Rough estimates of bass catches in various grids suggest that some 55% of the estimated bass catches east of Port Dover were caught by commercial fishermen in waters of Grid 96 and Nanticoke Shoal during 1987. However, commercial fishing practices changed in 1988 and reported effort in these waters was considerably reduced. Thus, in 1988, only 20% of the estimated bass catch in Area 3 apparently was derived from Grid 96 and the Nanticoke Shoal area. As the 1987 and 1988 studies were not designed to provide this level of resolution, the above information should be interpreted with a great deal of caution. These figures should be used only as very general indicators of trends among sub-areas, and not as a means to determine the absolute number of bass captured within the sub-areas.

4.3 MANAGEMENT IMPLICATIONS

Tagging studies in 1988 confirm that at least some bass from waters east of Port Dover do travel to the Inner Bay during the spawning season (Inner Bay would appear to be the single most important spawn-

ing and rearing area for bass in Long Point Bay; MacGregor and Witzel 1988). Therefore, bass inhabiting waters east of Port Dover cannot be ignored in the context of the important sport fishery for bass in the Inner Bay (see also MacGregor 1988). However, in interpreting Figures 10, 11 and 12 it is imperative that the reader realize that the arrows leading from the release sites to recapture sites in no way reflect the route taken, they simply are lines representing the shortest distance between the two points. We suspect that most bass actually follow the shoreline to reach the Inner Bay from these waters.

MacGregor (1988) estimated that if fishing mortality due to gill nets (under pre-1987 effort levels) was reduced to zero, an increase of some 21% in the population of the catchable segment by anglers (i.e. ages 4 and older) might be expected. Whether or not an increase of this magnitude would influence angler success rates to a perceptable degree is unclear; it may depend on how these extra fish were distributed within the bay. We have no evidence to suggest that incidental catches of this magnitude place the bass population at risk. Long Point Bay continues to support the best sport fishery for smallmouth bass in the Province of Ontario (MacGregor 1988) and, it appears to be getting better (angler CUE's have increased substantially in recent years).

If fisheries managers do wish to reduce the incidental catch, the results of this study (and those of MacGregor 1988) suggest that there may be ways of altering the operation of the commercial gillnet fishery to reduce the frequency of encounters with bass. Comparison of the total incidental catches of bass in 1987 and 1988 clearly demon-

strates that reducing total gillnet effort within the bay is an effective means to reduce the bass catches (i.e. effort declined and so did the bass catches). However, the results of simulated fishing in waters east of Port Dover are encouraging in that there would appear to be several means to reduce the incidental catch of bass without removing gill netting entirely. These largely involve discouraging gill netting in areas and at times when bass are most vulnerable to their gear. Clearly, bass are densest in rocky shoal areas of Peacock Point and Nanticoke Shoal; hence, a good means of reducing the incidental catch would be to reduce or eliminate gill netting in these areas during times when bass are most vulnerable. This critical period of vulnerability appears to be the July-September period, but this needs some confirmation with a follow-up survey in 1989.

Further examinations in 1988 confirm that many bass can survive release from gill nets, particularly if they are removed and released at the puller. This is substantiated by the fact that over half (53%) of the recaptured bass that we received in 1988 had been initially captured, tagged and released from gill nets. The key point here is that some bass can survive entanglement in gill nets if properly handled; thus, commercial fishermen should be encouraged (as a matter of good housekeeping) to remove bass and release them as soon as the nets are on board.

5.0 RECOMMENDATIONS

(1) Simulated commercial fishing in waters east of Port Dover should be repeated from spring through fall to confirm the critical period of vulnerability in these waters.

(2) The tagging program initiated in 1988 should be followed through in 1989 to collect more data concerning bass movements within the bay. Of particular use would be an emphasis on post-spawning movements from the Inner Bay.

(3) As our biological information concerning trends in the bass population (size, structure, mortality, growth, etc.) are inadequate, an index fishing program which targets on the bass populations should be implemented. However, a long-term committment to this program is required for it to be of any value to managers.

(4) Our studies of incidental catch (and the resulting management actions) have strong implications for fisheries management issues in many other waters of Ontario; therefore, any management actions should be monitored carefully in terms of:

    (a) compliance

    (b) effects on the incidental catch and on the bass populations, and

    (c) effects on the sport and commercial fisheries.

    A plan should be developed to ensure that close monitoring occurs and that the results are disseminated.

6.0 ACKNOWLEDGEMENTS

We wish to once again acknowledge each commercial fisherman who cooperated in this project, knowing full well the sensitivity of the issue.

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A special thanks from the senior author to all the staff of the Port Dover station for their excellent support during my 8-year tenure there. Finally, the contributions of Dixie Howe to this study merits special acknowledgement from the senior author. In my absence during the final critical months of preparation she "held the fort" on several fronts admirably. Thanks Dixie - my right arm is gone but not forgotten.

Table 1. Sampling schedule and numbers of fish captured per kilometer of gill net in simulated commercial fishing, Long Point Bay, 1988.

DATE	LOCATION	CUE (fish/km) SMALLMOUTH BASS	YELLOW PERCH	WHITE PERCH	TOTAL NON-TARGET	ALL FISH
May 3	29 (2B)	1.0	973.7	180.2	188.3	1161.9
	63 (5C)	0.0	93.1	36.4	57.7	150.8
	137	0.0	47.6	28.3	64.8	112.3
	134 (4D)	0.0	34.4	38.5	60.7	95.1
May 4	17 (8B)	2.0	565.8	549.6	610.3	1176.1
	72 (12B)	1 0	57.7	13.2	17.2	74.9
	185 (14C)	0.0	508.1	61.7	113.4	621.5
	227	0.0	827.9	95.1	160.9	988.9
May 25	55 (2B)	2.0	77.9	982.8	1019.2	1097.2
	62 (5C)	0.0	215.6	307.7	320.9	536.4
	137	0.0	1632.6	381.6	433.2	2065.8
	134 (4D)	0.0	760.1	89.1	99.2	859.3
May 27	16 (7B)	0.0	22.3	82.0	108.1	136.7
	119	0.0	117 4	23.3	32.6	183.6
	142 (14C)	0.0	933.2	455.5	665.4	1865.9
	208	0.0	2254.0	36.4	54.7	2954.4
June 1	96 (8C)	0.0	1091.2	187.2	289.1	1380.2
	120 (7D)	0.0	377.6	69.8	97.7	475.3
	140 (14C)	0.0	487.0	76.9	102.9	589.8
	206	0.0	1203.1	55.7	83.3	1286.5
June 2	79 (1B)	0.0	170.6	453.4	613.3	783.9
	65 (6C)	0.0	369.8	85.0	121 1	490.9
	161 (14C)	0 0	170.6	123.5	183.6	354.2
	159	0.0	281.2	36.4	70.3	351.6
June 7	20	24.7	446.6	1659.9	2338.5	2785.2
	74 (13B)	5.2	790.4	1313.8	1849.0	2639.3
	193	0.0	544.3	102.2	156.3	700.5
	213	0.0	510.4	71.9	128.9	639.3
June 8	56 (2B)	0.0	136.7	91.1	117.2	253.9
	85 (4C)	0.0	170.6	72.9	80.7	195.3
	158	0.0	195.3	35.2	45.6	240.9
	200	0.0	266.9	26.0	27.3	294.3
June 15	30 (2A)	0.0	59.9	43.0	53.4	113.2
	32 (3B)	0.0	45.6	44.3	58.6	104.2
	159	0.0	57.3	14.3	14.3	71.6
	178	0.0	125.0	20.8	26.0	151.0
June 16	15 (7B)	1.3	37.8	62.5	84.6	122.4
	24 (11B)	6.5	653.7	1097.7	1184.9	1838.5
	208	0 0	138.0	15.6	22.1	160.2
	205	0.0	183.6	48.2	61.2	244.8
June 21	3A	11.7	96.4	470.1	520.8	617.2
	3B	5.2	61.2	138.0	164.1	225.3
	3C	0.0	65.1	33.9	82.0	147.1
	3D	1.3	48.2	32.6	84.6	132.8
June 22	9A	0.0	35.2	43.0	62.5	97.7
	9B	3.9	69.0	127.6	173.2	242.2
	9C	0.0	114.6	105.5	162.8	277.3
	9D	0.0	97.7	41.7	63.8	161.5
June 29	2A	27.3	128.9	264.3	337.2	466.1
	2B	7.8	115.9	277.3	315.1	431.0
	2C	0.0	70.3	278.6	311.2	381.5
	2D	0.0	97.7	251.3	269.5	36 .2
June 30	6A	1.3	243.5	687.5	764.3	1007.8
	6B	2.6	226.6	395.8	442.7	669.3
	6C	1.3	79.4	204.4	257.8	337.2
	6D	1.3	139.3	169.3	197.9	337.2

... continued

Table 1 continued ...

DATE	LOCATION	CUE (fish/km) SMALLMOUTH BASS	YELLOW PERCH	WHITE PERCH	TOTAL NON-TARGET	ALL FISH
July 5	12B	49.5	143.2	869.8	962.2	1105.5
	12B	91.2	221.4	1575.5	1713.5	1934.9
	12B	50.8	286.5	2330.7	2442.7	2729.2
	12D	11.7	104.2	220.1	257.8	362.0
July 12	4A	5.2	118.5	710.9	751.3	869.8
	4B	3.9	79.4	333.3	350.3	429.7
	4C	0.0	23.4	97.7	123.7	147.1
	4D	0.0	37.8	115.9	149.7	187.5
July 13	10A	84.6	324.2	695.3	783.9	1108.1
	10B	24.7	188.8	213.5	265.6	454.4
	10C	10.4	87.2	273.4	312.5	399.7
	10D	0.0	63.8	154.9	179.7	243.5
July 14	11A	27.3	356.8	679.7	778.7	1135.4
	11B	18.2	188.8	170.6	224.0	412.8
	11C	1.3	95.1	136.7	152.3	247.4
	11D	1.3	114.6	87.2	112.0	226.6
July 20	7A	10.4	322.9	221.4	250.0	572.9
	7B	9.1	96.4	273.4	303.4	399.7
	7C	5.2	61.4	217.4	281.3	342.4
	7D	2.6	88.5	106.8	144.5	233.1
July 26	13B	3.9	329.4	23.4	118.5	447.9
	13B	13.0	552.1	40.4	95.1	647.1
	8C	15.6	164.1	158.9	251.3	415.4
	8D	5.2	109.4	46.9	61.2	170.6
July 27	8A	2.6	113.3	35.2	74.2	187.5
	8B	10.4	168.0	58.6	117.2	285.2
	13B	20.8	278.7	188.8	273.4	552.1
	13D	2.6	139.3	63.8	83.3	222.7
July 28	14C	26.0	606.8	140.6	235.7	842.4
	14C	9.1	85.9	5.2	30.0	115.9
	14C	24.7	355.5	40.4	104.2	459.6
	14B	100.3	1540.4	225.3	489.6	2029.9
Aug. 3	1A	7.8	635.4	19.5	377.6	1013.0
	1B	5.2	819.0	14.3	265.6	1084.6
	1C	9.1	69.0	1.3	26.0	95.1
	1D	7.8	48.2	0.0	54.7	102.9
Aug. 4	5A	16.9	1868.5	95.1	492.2	2360.7
	5B	23.4	507.8	46.9	181.0	688.8
	5C	2.6	115.9	10.4	26.0	141.9
	5D	5.2	130.0	22.1	39.1	169.3
Aug. 10	4A	2.6	1096.4	14.3	89.8	1186.2
	4B	0.0	273.4	7.8	22.1	295.6
	4C	2.6	265.6	5.2	18.2	287.8
	4D	0.0	138 0	53.4	74.2	212.2
Aug. 11	6A	9.1	1281 3	67.7	259.1	1540.4
	6B	14.3	1108.1	82.0	278.7	1386.7
	6C	9.1	825.5	54.7	143.2	968.8
	6D	2.6	199.2	80.7	108.1	307.3
Aug. 23	2A	14.3	471.4	359.4	553.4	1024.7
	2B	41.7	351.6	644.5	903.7	1255.2
	2C	5.2	1070.3	675.8	724.0	1794.3
	2D	6.5	1304.7	638.0	681.0	1985.7
Aug. 25	5A	1.3	234.4	40.4	242.2	476.6
	5B	6.5	171.9	82.0	235.7	407.6
	5C	36.5	402.3	322.9	462.2	864.6
	5D	52.1	881.5	768.2	899.7	1781.3

... continued

Table 1 continued ...

DATE	LOCATION	CUE (fish/km) SMALLMOUTH BASS	YELLOW PERCH	WHITE PERCH	TOTAL NON-TARGET	ALL FISH
Aug. 30	7A	2.6	282.6	56.0	175.8	458.3
	7B	1.3	367.2	57.3	144.5	511.7
	7C	10.4	1779.9	234.4	299.5	2079.4
	7D	0.0	1737.0	149.7	158.9	1895.8
Aug. 31	12B	10.4	207.0	29.9	71.6	278.6
	12B	67.7	1113.3	351.6	600.3	1713.5
	12B	53.4	1184.9	85.9	248.7	1433.6
	12D	13.0	1170.6	39.1	78.1	1248.7
Sept. 7	8A	12.0	287.2	217.1	329.9	617.1
	8B	8.6	581.2	141.9	208.6	789.7
	8C	46.2	528.2	191.5	324.8	853.0
	8D	6.8	1770.9	765.8	801.7	2572.6
Sept. 8	1A	6.8	362.4	6.8	263.3	625.6
	1B	8.6	65.0	5.1	242.7	307.7
	1C	37.6	559.0	1381.2	1478.6	2037.6
	1D	8.6	644.4	953.8	1012.0	1656.4
Sept. 13	13B	12.0	63.3	198.3	302.6	365.8
	13B	25.6	188.0	124.8	220.5	408.5
	13B	54.7	160.7	141.9	319.7	480.3
	13D	51.3	562.4	256.4	581.2	1143.6
Sept. 22	9A	6.8	210.3	159.0	386.3	596.6
	9B	3.4	194.9	164.1	275.2	470.1
	9C	47.9	367.5	162.4	306.0	673.5
Sept. 27	10A	13.7	345.3	29.1	85.5	430.8
	10B	13.7	109.4	27.4	116.2	225.6
	10C	34.2	189.7	114.5	200.0	389.7
	10D	85.5	1502.6	444.4	564.1	2066.7
Oct. 4	3A	3.4	100.9	35.9	235.9	336.8
	3B	5.1	131.6	17.1	263.3	394.9
	3C	27.4	314.5	22.2	189.7	504.3
	3D	5.1	676.9	30.8	465.0	1141.9
Oct. 6	2A	0.0	141.9	85.5	406.8	548.7
	2B	0.0	97.4	116.2	318.0	415.4
	2C	23.9	51.3	23.9	336.8	388.0
	2D	3.4	114.5	22.2	461.5	576.1
Oct. 20	4A	1.7	15.4	17.1	237.6	253.0
	4B	10.3	85.5	20.5	312.8	398.3
	4C	1.7	198.3	85.5	147.0	345.3
	4D	0.0	495.7	85.5	129.9	625.6
Nov. 3	14C	0.0	34.2	112.8	179.5	213.7
	14C	0.0	5.1	15.4	49.6	63.2
	14C	0.0	41.0	49.6	102.6	143.6
	14B	3.4	47.9	165.8	215.4	263.2
POOLED LOCATIONS		10.8	400.1	235.5	316.7	716.8

Table 2. Percent of entangled smallmouth bass alive (A) at the puller, and (B) after the entire strap was on board and picked, simulated commercial fishing, Long Point Bay, 1988.

DATE	A. NO. BASS ENTANGLED	A. ASSESSED AT PULLER NO. ALIVE	A. ASSESSED AT PULLER % ALIVE	B. NO. BASS ENTANGLED	B. ASSESSED AFTER STRAP ON BOARD AND PICKED NO. ALIVE	B. ASSESSED AFTER STRAP ON BOARD AND PICKED % ALIVE
May 3	1	1	100.0	0	-	-
May 4	2	2	100.0	1	0	0.0
May 25	2	2	100.0	0	-	-
June 7	19	12	63.2	4	1	25.0
June 15	1	1	100.0	5	5	100.0
June 19	9	9	100.0	5	5	100.0
June 22	0	-	-	3	3	100.0
June 29	21	20	95.2	6	6	100.0
June 30	2	2	100.0	3	3	100.0
July 5	77	45	58.4	79	27	34.2
July 12	4	4	100.0	3	2	66.7
July 13	73	47	64.4	19	9	47.4
July 14	22	13	59.1	15	0	0.0
July 20	12	8	66.7	9	3	33.3
July 26	15	11	73.3	13	4	30.8
July 27	18	12	66.7	10	5	50.0
July 28	39	18	46.2	84	4	4.8
Aug. 3	13	10	76.9	10	2	20.0
Aug. 4	15	11	73.3	22	0	0.0
Aug. 10	4	4	100.0	0	-	-
Aug. 11	14	12	85.7	13	2	15.4
Aug. 23	15	4	26.7	37	0	0.0
Aug. 25	29	15	51.7	45	1	2.2
Aug. 30	10	8	80.0	1	0	0.0
Aug. 31	49	36	73.5	62	1	1.6
Sept. 7	34	17	50.0	9	0	0.0
Sept. 8	26	21	80.8	10	3	30.0
Sept. 13	30	21	70.0	45	10	2.2
Sept. 22	32	27	84.4	2	1	50.0
Sept. 27	38	9	23.7	58	0	0.0
Oct. 4	18	18	100.0	6	5	83.3
Oct. 6	14	13	92.8	2	2	100.0
Oct. 20	2	2	100.0	6	6	100.0
Nov. 3	0	-	-	2	2	100.0
POOLED						
May - June	57	49	86.0	27	23	85.2
July - Aug.	409	258	63.1	422	60	14.2
July - Sept.	569	353	62.0	546	74	13.6
Oct. - Nov.	34	33	97.1	16	15	93.8
All Months	660	435	65.9	589	112	19.0

Table 3. Sampling schedule, gillnet effort, catches and CUE's of smallmouth bass and yellow perch observed in actual catches by commercial fishermen, Areas 1 and 2, Long Point Bay, 1988.

FISHERMAN NO.	LIFT DATE	GRID LOC.	EFFORT (km)	SMALLMOUTH BASS				YELLOW PERCH			
				TOTAL NO.	TOTAL WT. (kg)	CUE		TOTAL[1] NO.	TOTAL WT. (kg)	CUE	
						No./km	kg/km			No./km	kg/km
1	May 10	111	1.783	0	0.0	0.0	0.0	1545	181.4	866.5	101.7
3	May 13	110	1.790	0	0.0	0.0	0.0	1931	226.8	1078.8	126.7
6	May 19	111	2.300	0	0.0	0.0	0.0	1545	181.4	671.7	78.9
8	May 26	111	0.960	0	0.0	0.0	0.0	1622	190.5	1689.6	198.4
9	May 27	111	0.495	0	0.0	0.0	0.0	387	45.4	781.8	91.7
14	June 3	139	0.640	0	0.0	0.0	0.0	193	22.7	301.6	35.5
15	June 7	139	3.158	0	0.0	0.0	0.0	463	54.4	146.6	17.2
16	June 10	111	0.985	0	0.0	0.0	0.0	309	36.3	313.7	36.9
18	June 16	139	5.915	0	0.0	0.0	0.0	2317	272.1	391.7	46.0
19	June 21	139	1.750	0	0.0	0.0	0.0	1042	122.4	595.4	69.9
21	June 23	111	0.960	0	0.0	0.0	0.0	76	9.1	79.2	9.5
22	June 23	138, 139	4.575	0	0.0	0.0	0.0	772	90.7	168.7	19.8
25	Aug. 15	94	1.300	21	3.3	16.2	2.5	3765	442.2	2896.2	340.2
26	Aug. 18	110	2.520	40	7.2	15.9	2.9	2317	272.1	919.4	108.0
27	Aug. 18	137	2.563	8	1.5	3.1	0.6	6565	771.0	2561.5	300.8
29	Aug. 23	111, 139	2.180	52	10.5	23.9	4.8	1931	226.8	885.8	104.0
30	Aug. 24	111	2.990	20	3.8	6.7	1.3	2317	272.1	774.9	91.0
32	Aug. 30	137	1.970	0	0.0	0.0	0.0	986	115.8	500.5	58.8
33	Sept. 1	94, 137	3.775	34	4.0	9.0	1.1	1159	136.1	307.0	36.1
36	Sept. 7	94	1.200	17	2.6	14.2	2.2	135	15.9	112.5	13.3
38	Sept. 12	137	0.940	0	0.0	0.0	0.0	888	104.3	944.7	111.0
39	Sept. 12	110, 137	3.205	15	2.6	4.7	0.8	1660	195.0	517.9	60.8
40	Sept. 15	138	2.695	0	0.0	0.0	0.0	1738	204.1	644.9	75.7
43	Sept. 19	111	1.475	15	2.0	10.2	1.4	1545	181.4	1047.5	123.0
44	Sept. 22	111	2.580	3	0.5	1.2	0.2	6797	798.2	2634.5	309.4
45	Sept. 26	111	0.920	27	2.9	29.3	3.2	926	108.8	1006.5	118.3
46	Sept. 29	111	2.870	1	0.2	0.3	0.1	1892	222.2	659.2	77.4
48	Oct. 6	111, 138	2.700	0	0.0	0.0	0.0	1117	131.2	413.7	48.6
POOLED LOCATIONS											
July - September			33.183	253	41.1	7.6	1.2	34621	4066.0	1043.3	122.5
All Months			61.194	253	41.1	4.1	0.7	47940	5630.4	783.4	92.0

[1]Number of yellow perch estimated from landed weight (average weight = 117.4 g).

Table 4. Sampling schedule, gillnet effort, catches and CUE's of smallmouth bass and yellow perch observed in actual catches by commercial fishermen, Area 3, Long Point Bay, 1988.

				SMALLMOUTH BASS				YELLOW PERCH			
FISHERMAN NUMBER	DATE	LOC.	EFFORT (km)	TOTAL NO.	TOTAL WT. (kg)	CUE No./km	CUE kg/km	TOTAL[1] NO.	TOTAL WT. (kg)	CUE No./km	CUE kg/km
2	May 11	97	0.600	1	0.3	1.7	0.5	908	106.6	1513.3	177.7
4	May 18	97	0.815	1	0.4	1.2	0.5	425	49.9	521.5	61.2
5	May 19	112	2.685	0	0.0	0.0	0.0	6179	725.6	2301.3	270.2
7	May 25	112	2.057	0	0.0	0.0	0.0	6179	725.6	3003.9	352.7
10	May 27	97	0.520	0	0.0	0.0	0.0	676	79.4	1300.0	152.7
11	June 1	112	3.171	0	0.0	0.0	0.0	888	104.3	280.0	32.9
12	June 1	113	6.655	0	0.0	0.0	0.0	6565	771.0	986.5	115.9
13	June 1	113	3.500	0	0.0	0.0	0.0	5793	680.3	1655.1	194.4
17	June 16	114	6.285	0	0.0	0.0	0.0	2317	272.1	391.7	46.0
20	June 21	113	1.829	0	0.0	0.0	0.0	251	29.5	137.2	16.1
23	July 7	94	1.270	15	1.6	11.8	1.3	387	45.4	304.7	35.7
24	July 26	112	2.775	12	1.5	4.3	0.5	946	111.1	340.9	40.0
28	Aug. 22	95	0.725	66	9.8	91.0	13.5	444	52.5	612.4	72.0
31	Aug. 29	94	0.745	0	0.0	0.0	0.0	463	54.4	621.5	73.0
32	Aug. 30	95	2.660	82	11.5	17.7	2.5	1331	156.3	500.4	58.8
34	Sept. 1	96	3.060	3	0.3	1.0	0.1	3572	419.5	1167.3	137.1
35	Sept. 2	96, 113	3.860	3	0.5	0.7	0.1	4789	562.4	1240.7	145.7
37	Sept. 8	112, 113	3.665	10	1.4	2.7	0.4	6218	730.9	1696.6	199.4
41	Sept. 16	96, 113	2.475	62	9.1	17.8	2.6	6951	816.3	2000.3	234.9
42	Sept. 19	113	2.760	22	3.2	8.0	1.2	1738	204.1	629.7	73.9
47	Oct. 4	114	2.125	0	0.0	0.0	0.0	4017	471.7	1890.4	222.0
48	Oct. 6	112	1.500	2	0.4	0.5	0.1	621	72.9	414.0	48.6
POOLED LOCATIONS											
July - September			23.995	275	38.9	11.5	1.6	26839	3152.9	1118.5	131.4
All Months			55.737	279	40.0	5.0	0.7	61658	7241.8	1106.2	129.9

[1]Number of yellow perch estimated from landed weight (average weight = 117.4 g)

Table 5(a). Estimated catches, harvests and observed catches per rod-hour (CUE) of smallmouth bass by anglers seeking bass in Long Point Bay, 1978-1988. Data are derived from annual creel surveys carried out by OMNR (see MacGregor and Witzel, 1987 for overview of this program).

YEAR	CATCH (NUMBERS)	HARVEST (NUMBERS)	OBS. CUE
1978	49637	41316	0.298
1979	79579	70328	0.352
1980	56226	47306	0.334
1981	63730	56139	0.276
1982	89301	73461	0.349
1983	90052	66712	0.452
1984	61849	43006	0.352
1985	69473	58398	0.418
1986	71262	57322	0.414
1987	50008	36316	0.441
1988	73968	60641	0.536

Table 5(b). Age composition (%), mean total lengths (cm) and mean ages (yrs) of angler harvests of smallmouth bass in Inner Long Point Bay, 1979-1988.

	% BY AGE										MEAN AGE	MEAN LENGTH	NO.
YEAR	II	III	IV	V	VI	VII	VIII	IX	X	XI	(YRS.)	(cm)	SAMPLED
1979	1	26	31	22	15	3	2	--	-	--	4.4	29.8	178
1981	1	18	51	18	2	6	3	2	-	--	4.2	31.5	119
1982	29	17	17	24	8	2	-	2	2	--	3.9	29.6	59
1983	4	59	17	13	5	1	-	1	-	--	3.6	28.6	161
1984	1	34	44	6	7	3	1	2	1	--	4.1	30.2	163
1985	--	29	52	15	3	1	-	--	-	--	4.0	29.9	145
1986	--	31	33	30	4	1	-	--	-	--	4.2	30.8	96
1987	4	24	44	10	9	7	1	1	-	--	4.3	31.0	91
1988	--	4	40	30	14	8	1	2	1	--	5.0	32.9	324

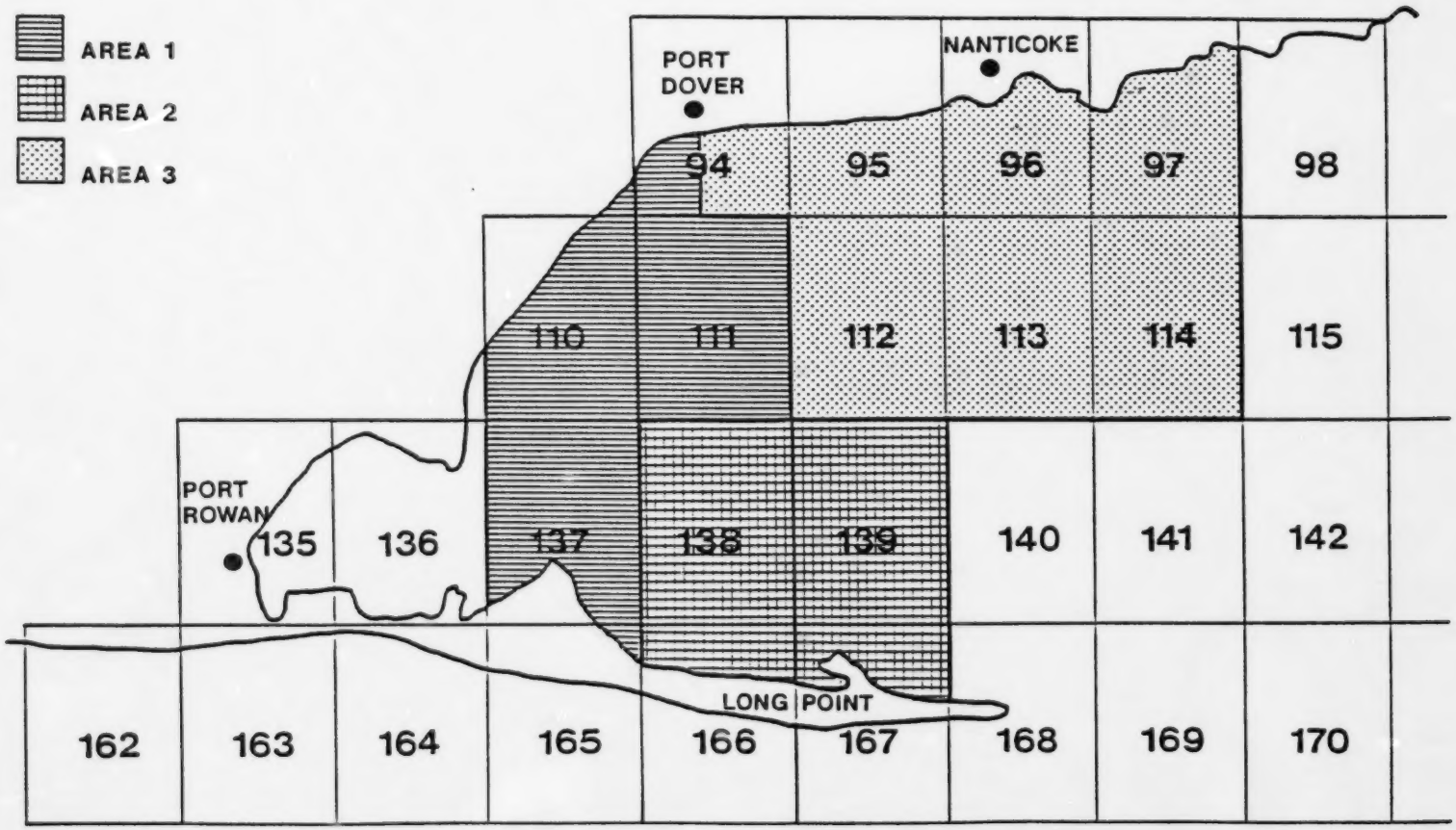


Figure 1. Commercial fishing location grids and boundaries of Areas 1, 2 and 3, Long Point Bay.

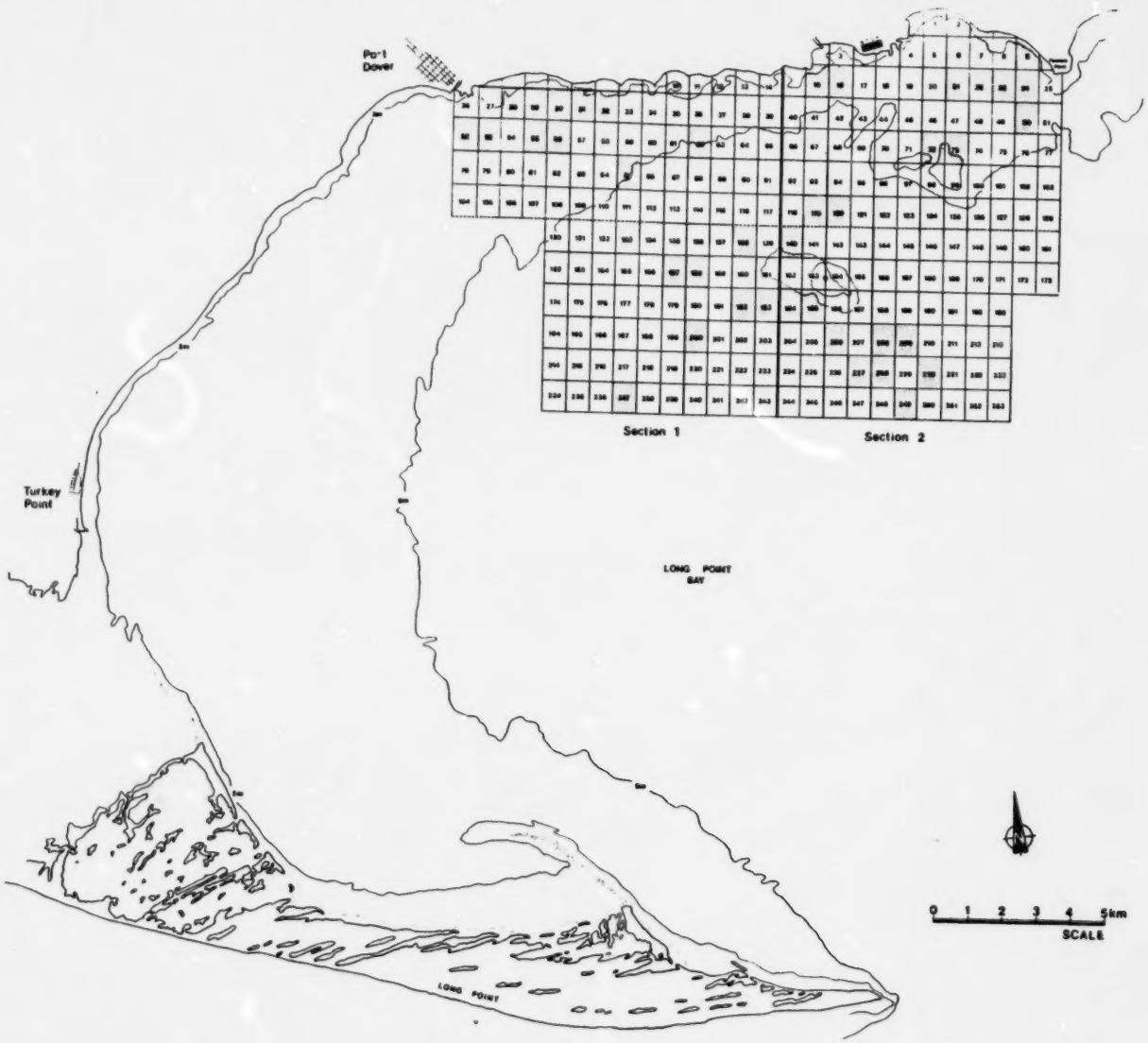


Figure 2. Grid sampling sites (shaded grids were those fished most frequently in our 1987 On-Board Sampling Survey) (cf. MacGregor, 1988).

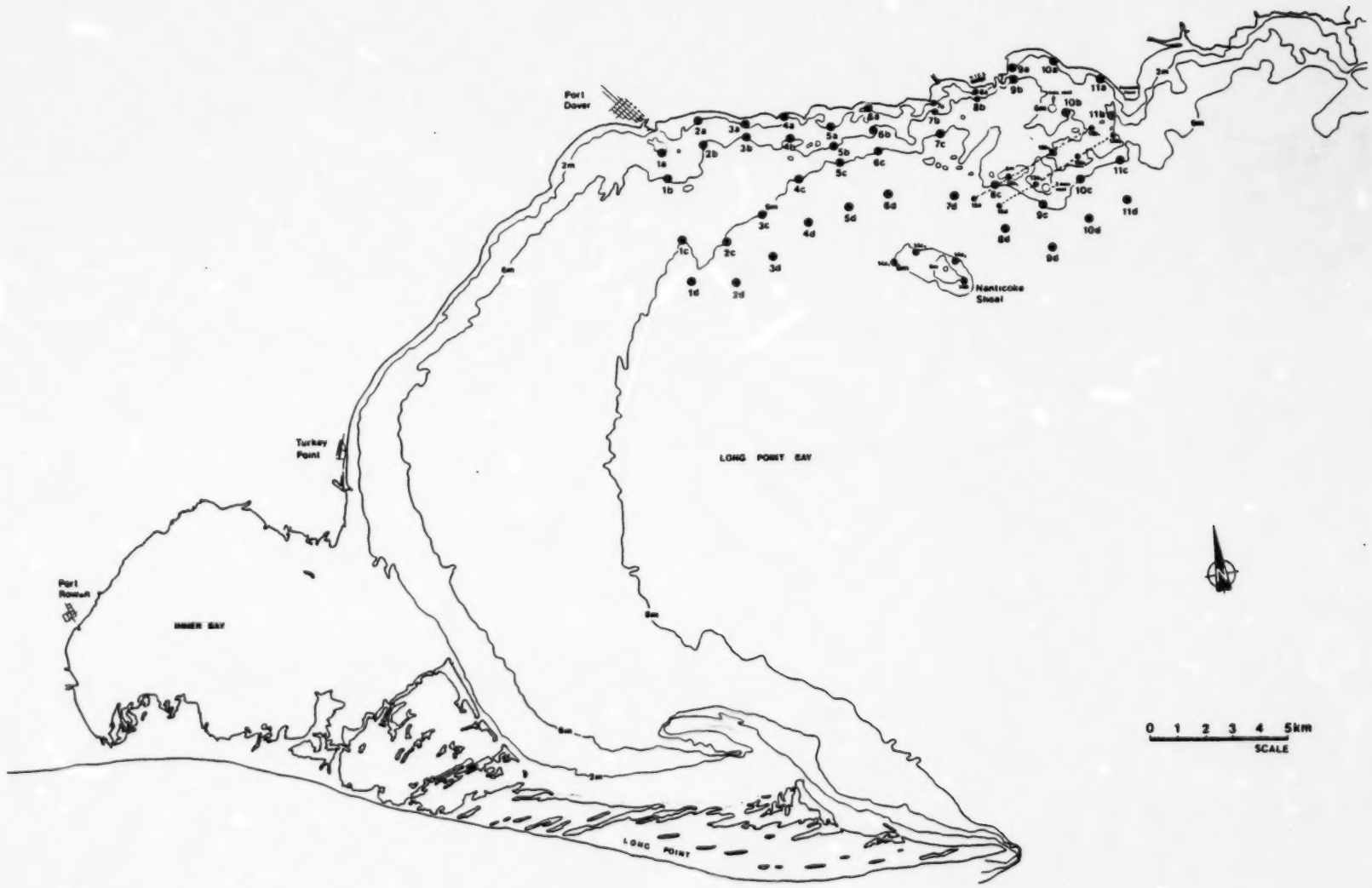


Figure 3. Sampling sites for Transect Fishing which began on June 21, 1988.

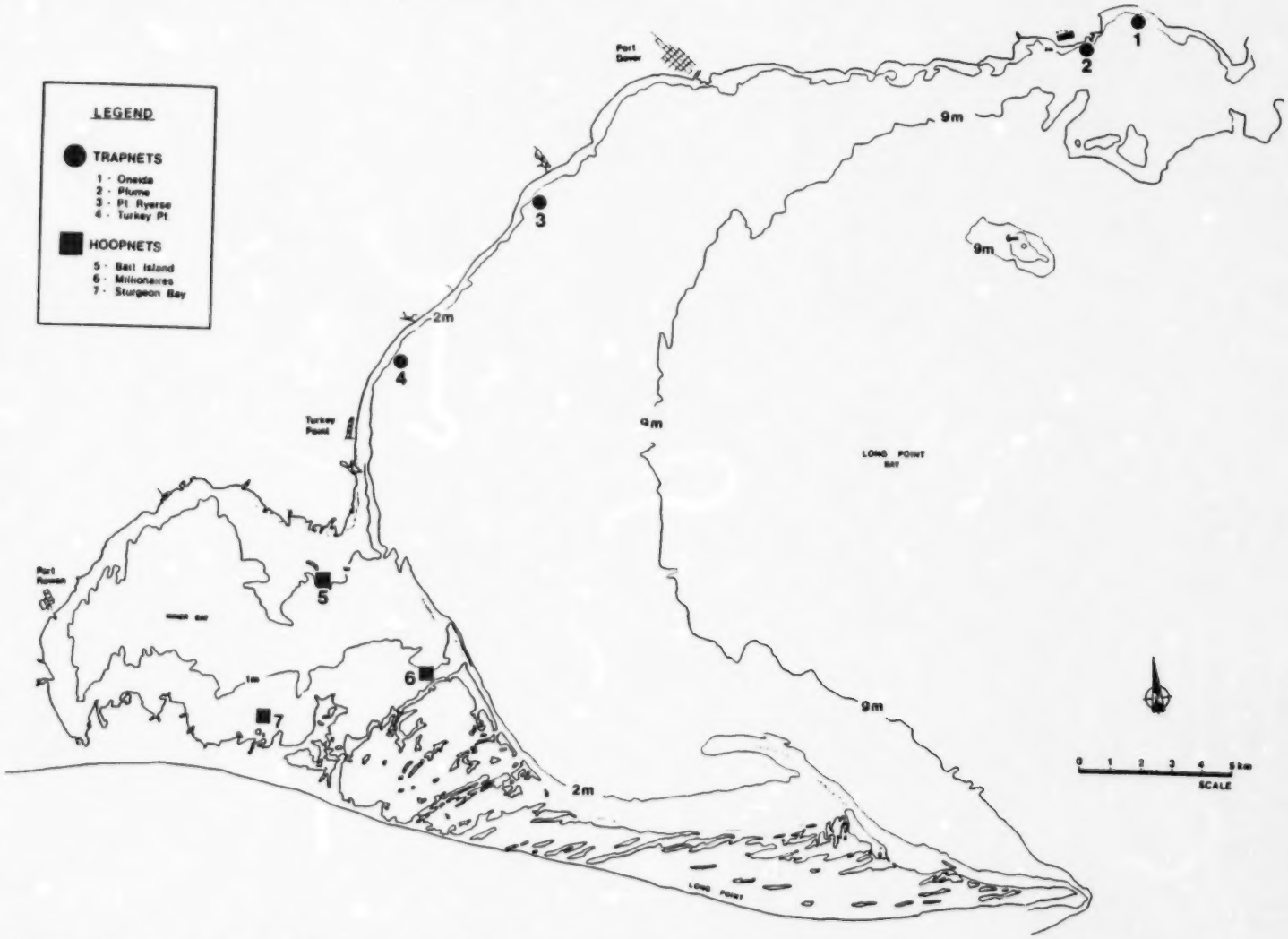


Figure 4. Trapnet and hoopnet sampling sites, used to collect live smallmouth bass for tagging, Long Point Bay, 1988.

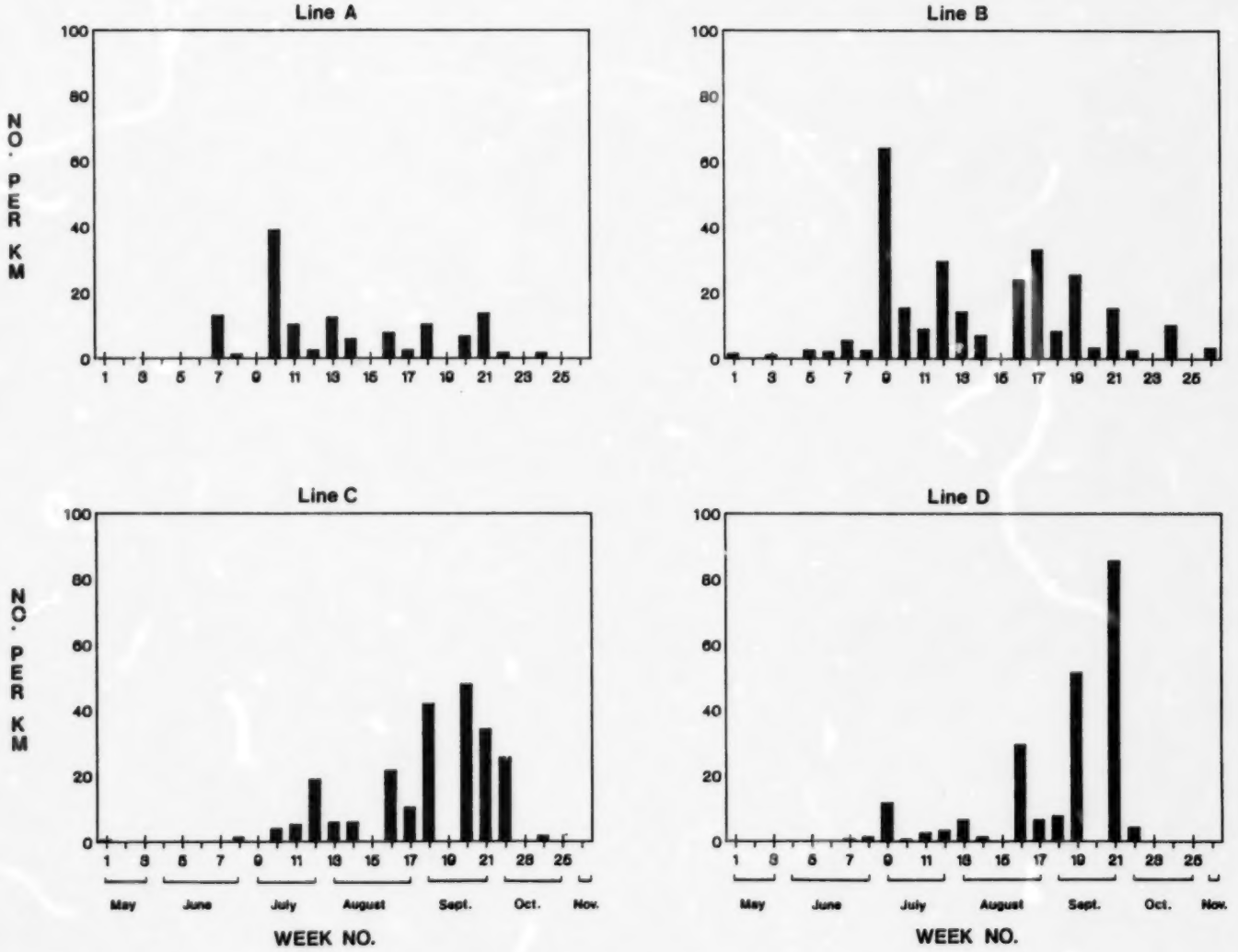


Figure 5. Weekly CUE's (fish/km) of smallmouth bass on Lines A, B, C and D during simulated commercial fishing, Long Point Bay, 1988.

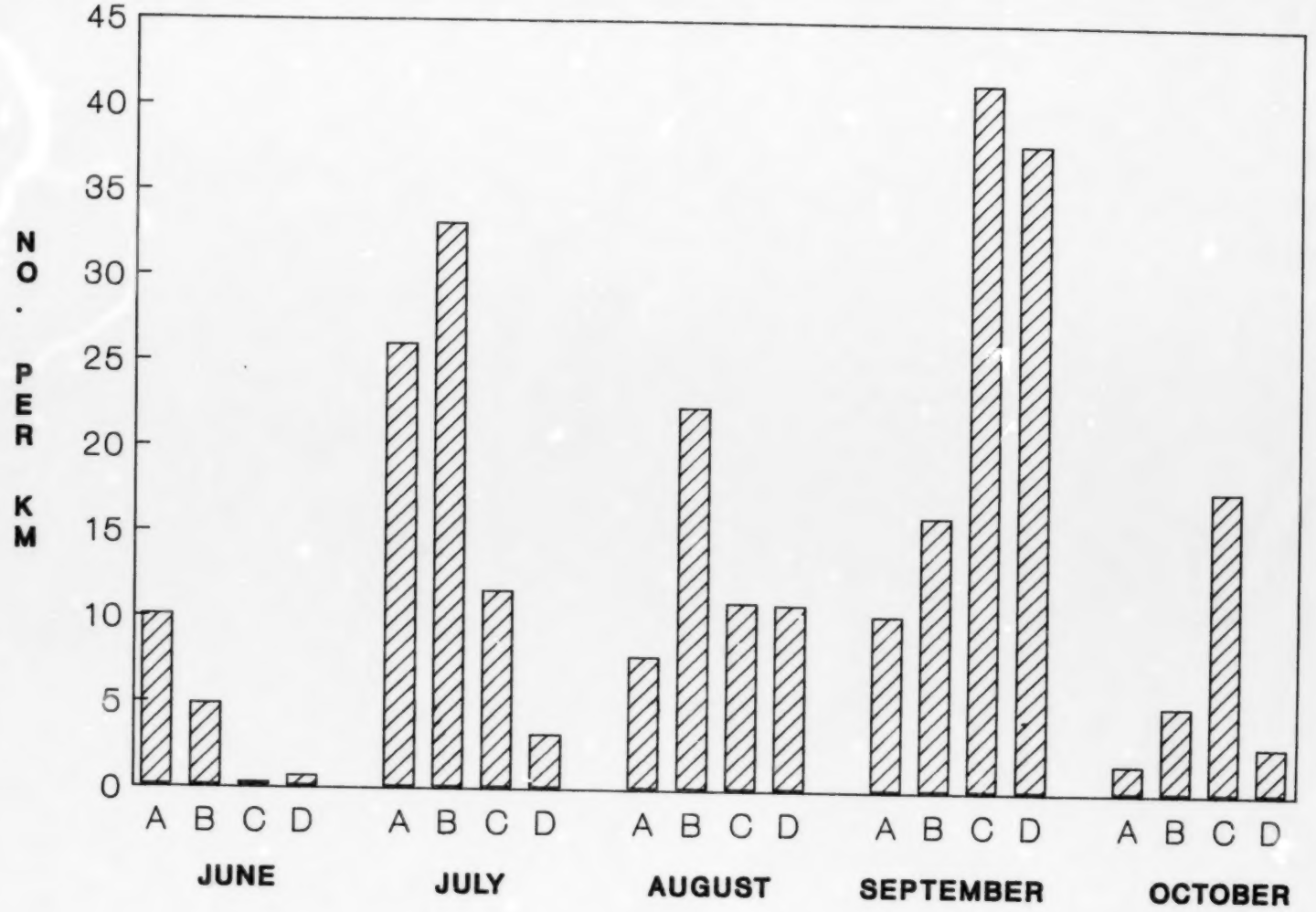


Figure 6. Comparative CUE's (fish/km) of smallmouth bass on Lines A, B, C and D during simulated commercial fishing, Long Point Bay, 1988.

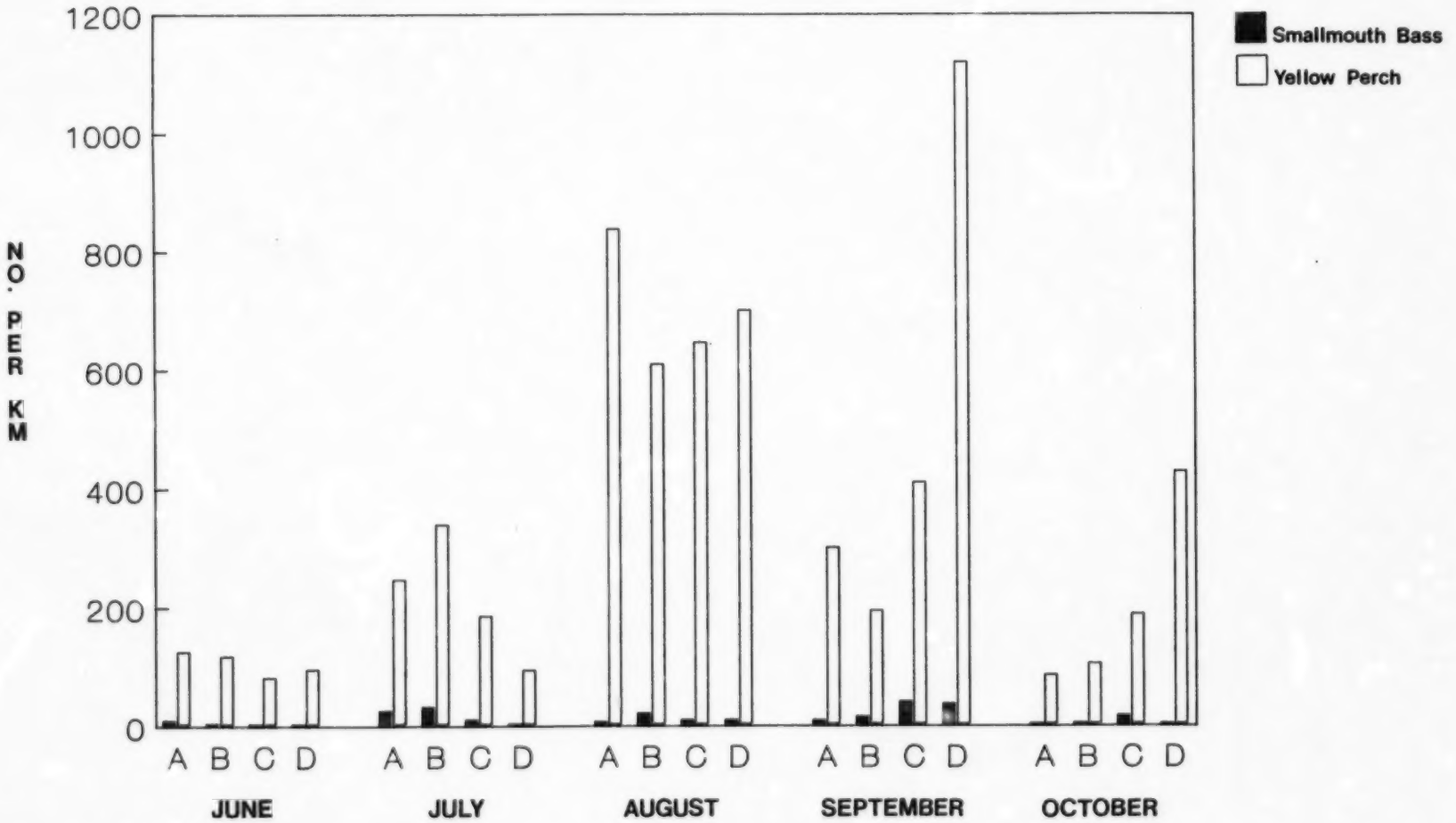


Figure 7. Comparative CUE's (fish/km) of yellow perch and smallmouth bass on Lines A, B, C and D (Figure 3) during simulated commercial fishing, Long Point Bay, 1988.

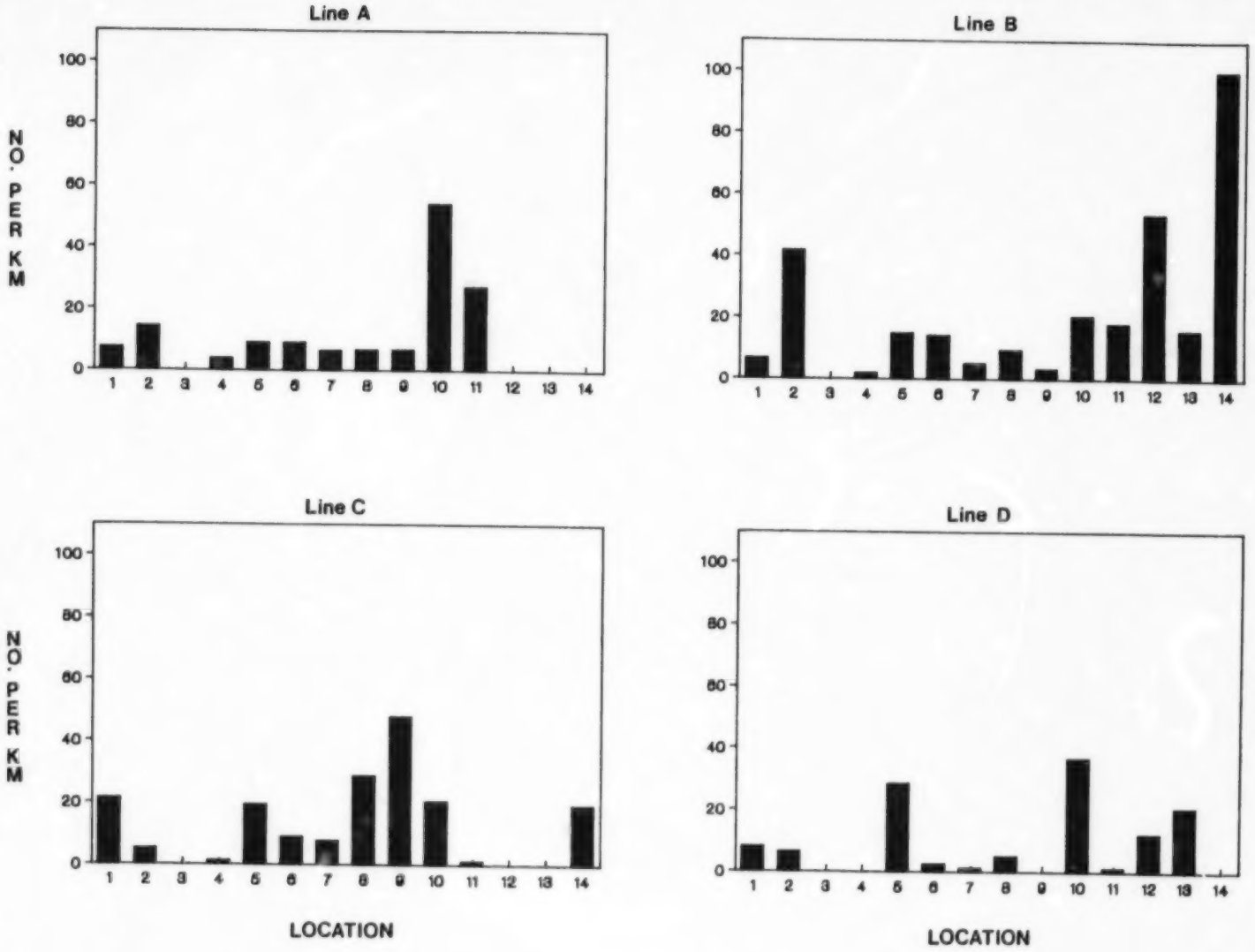


Figure 8. Comparative CUE's (fish/km) of smallmouth bass in commercial gill nets at transect sites along Lines A, B, C and D of Figure 3 during simulated commercial fishing, Long Point Bay 1988 (July - September data pooled).

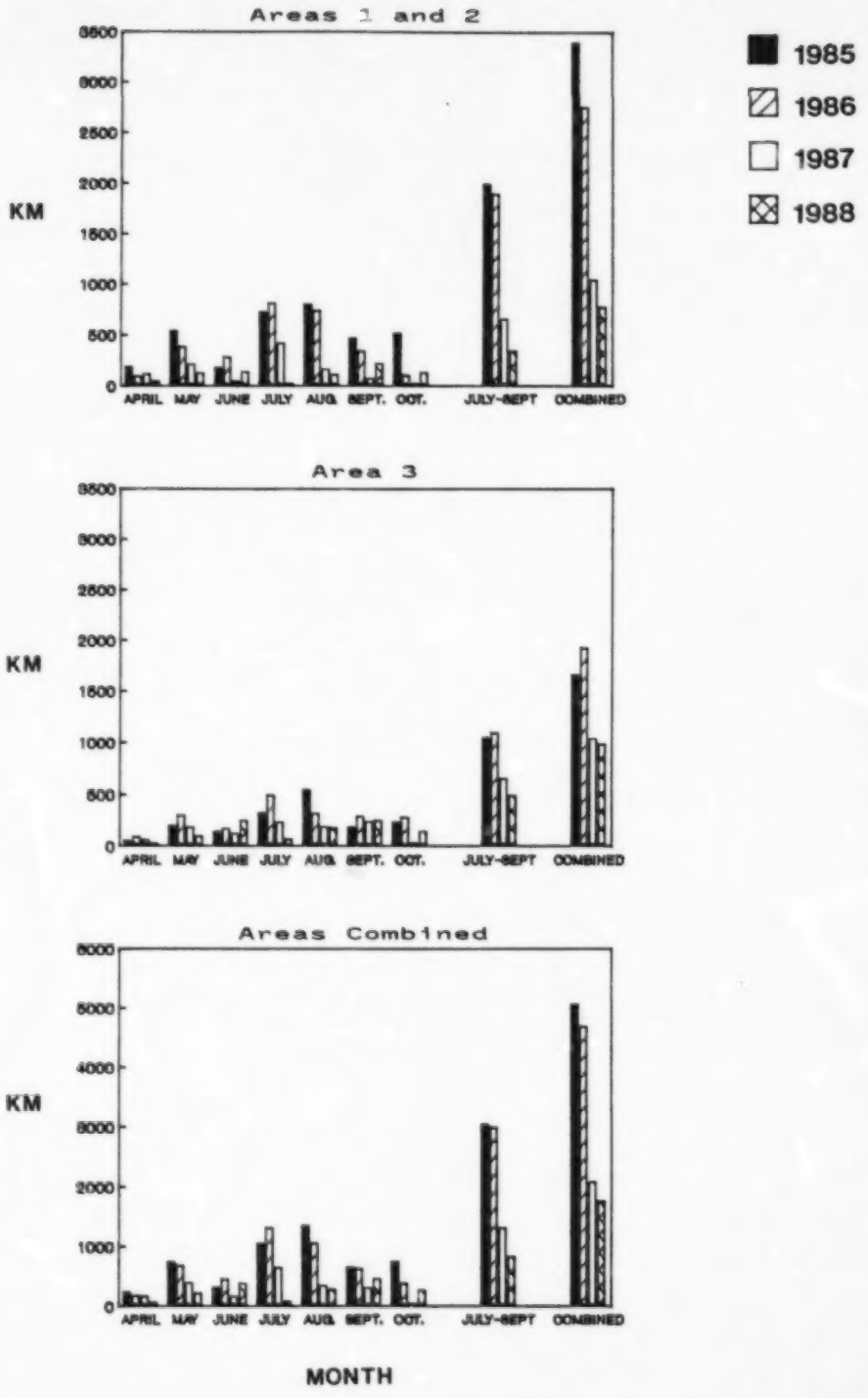


Figure 9. Annual commercial fishing effort (km of gill net) expended in various areas of Long Point Bay between 1985 and 1988.

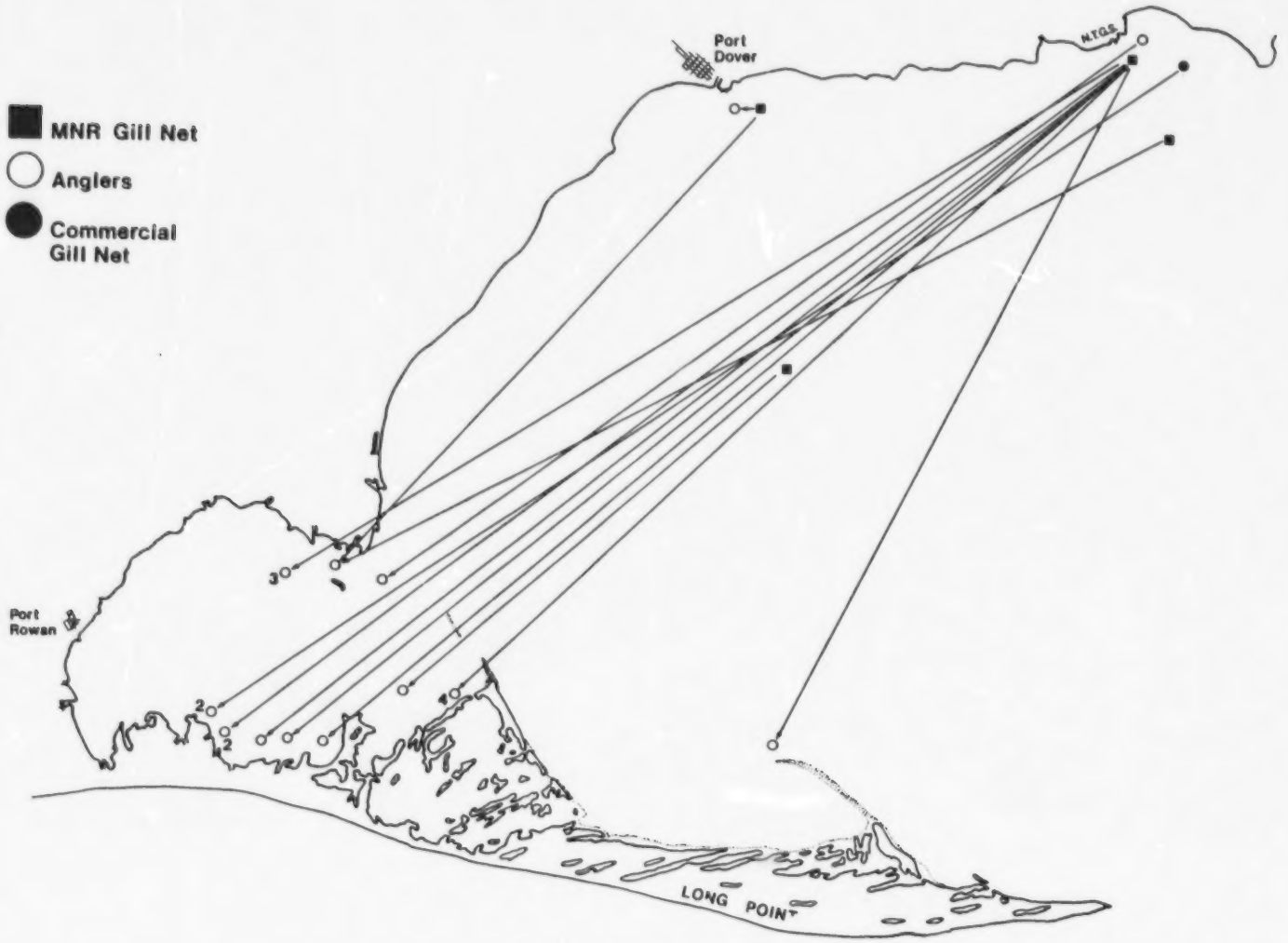


Figure 10. Smallmouth bass captured and released from MNR gill nets, commercial gill nets and by MNR anglers and recaptured on or between June 25 - July 29, Long Point Bay, Lake Erie, 1988.

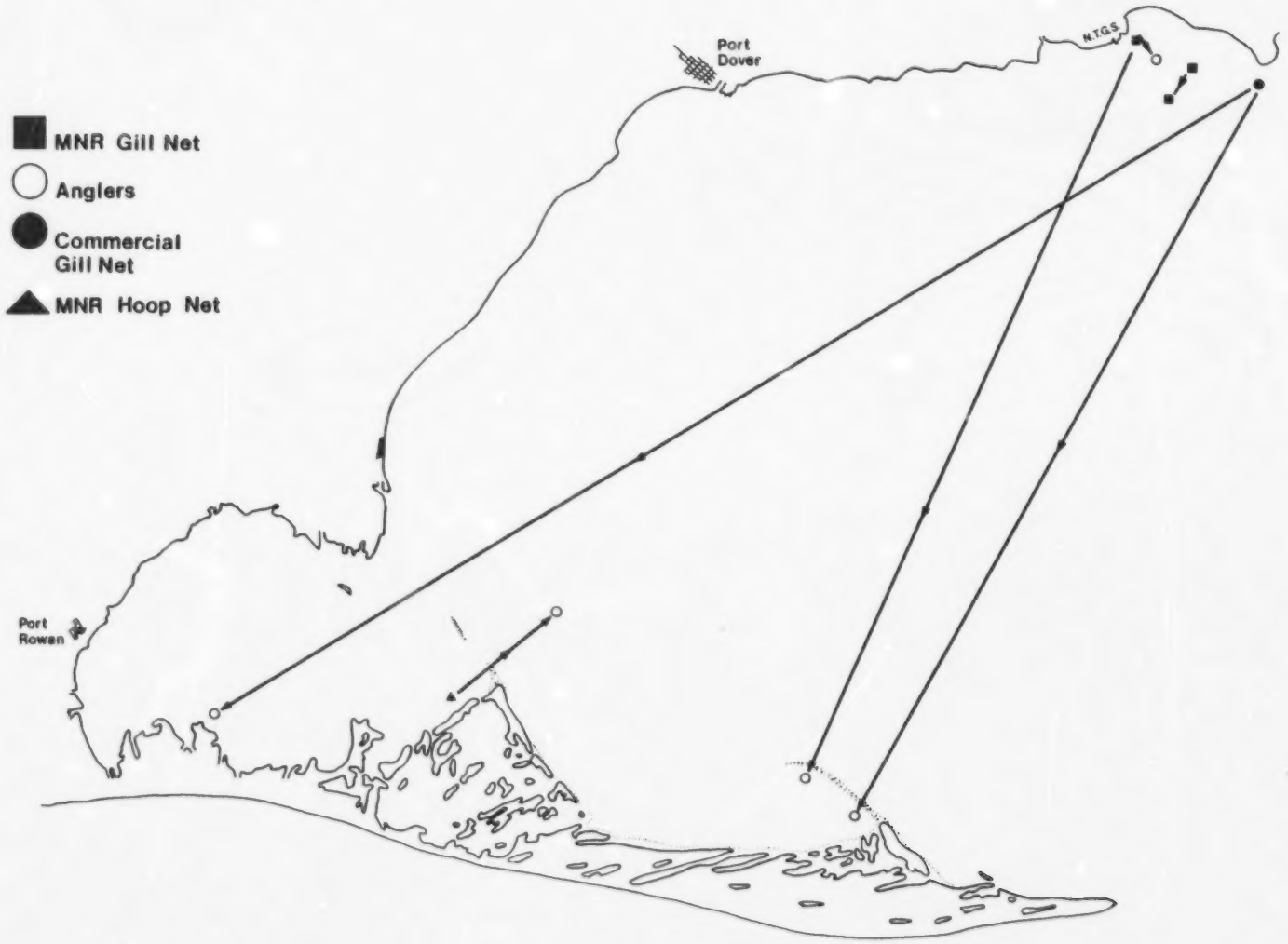


Figure 11. Smallmouth bass captured and released from MNR gill nets, commercial gill nets and MNR hoop nets and recaptured on or after July 30, Long Point Bay, Lake Erie, 1988.

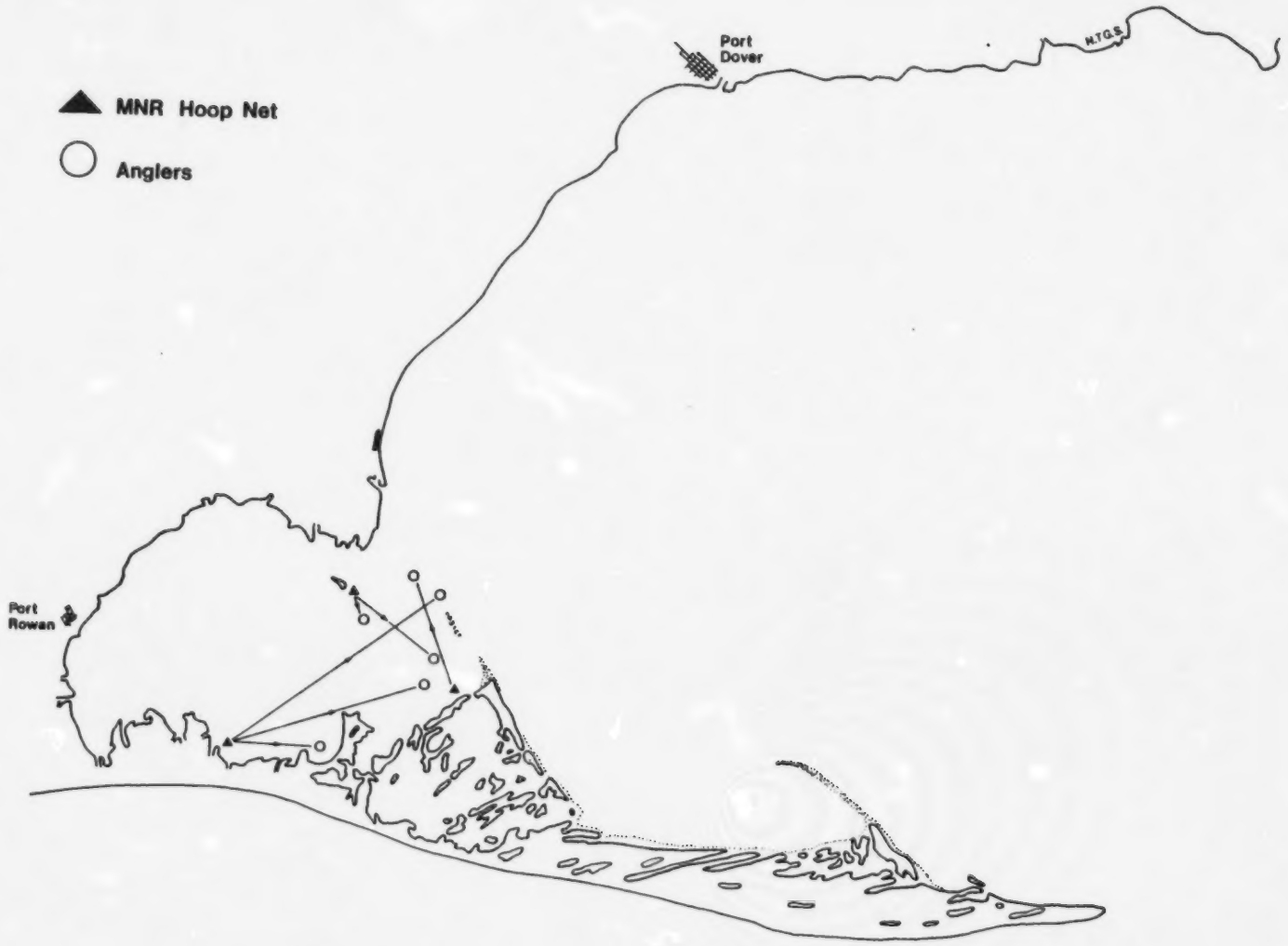


Figure 12. Smallmouth bass captured and released from MNR hoop nets before opening day of bass season and recaptured on or between June 25 - July 29, Long Point Bay, Lake Erie, 1988.

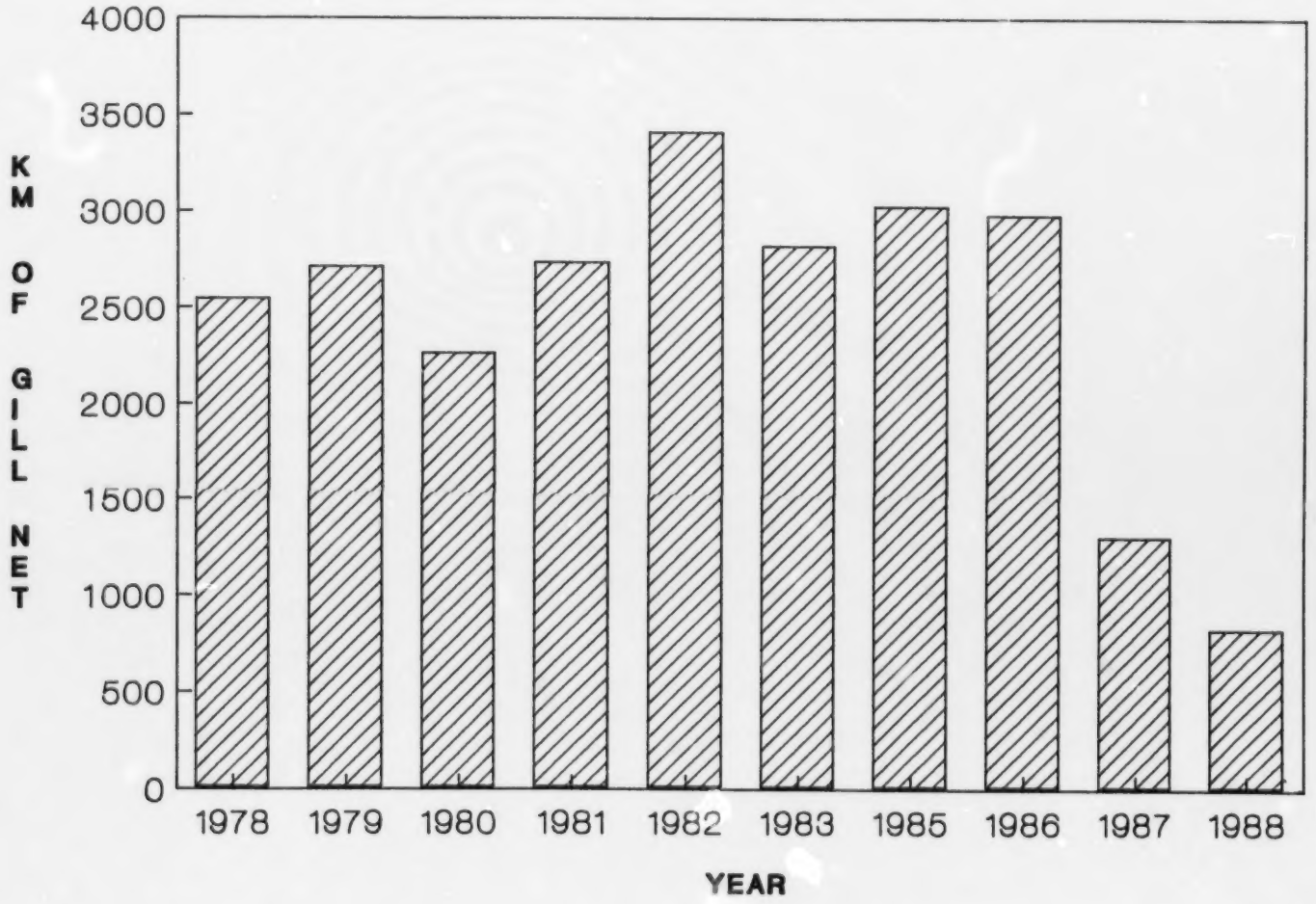


Figure 13. Annual commercial gillnet effort (km of net) expended in Long Point Bay, July - September, 1978-1988.

Figure 14. Location of Fishing Reserve Boundary and the 1 km extension in effect July and August, 1988.

Appendix Table I. Sampling schedule, catches and numbers of smallmouth bass and yellow perch captured per kilometer of gill net during the simulated commercial fishing program, Long Point Bay, 1988.

				SMALLMOUTH BASS				YELLOW PERCH			
						CUE				CUE	
DATE	LOCATION	EFFORT (km)	DEPTH (m)	Total No.	Total Wt. (kg)	No/km	kg/km	Total No.	Total Wt. (kg)	No/km	kg/km
May 3	29 (2B)	0.988	5.8	1	0.70	1.01	0.71	962	109.3	973.7	110.6
	63 (5C)	0.988	11.0	0	0.00	0.00	0.00	92	12.4	93.1	12.6
	137	0.988	12.8	0	0.00	0.00	0.00	47	5.5	47.6	5.6
	134	0.988	11.9	0	0.00	0.00	0.00	34	3.8	34.4	3.8
May 4	17 (8B)	0.988	8.8	2	0.26	2.02	0.26	559	64.0	565.8	64.8
	72 ($12B_2$)	0.988	7.6	1	1.20	1.01	1.21	57	7.0	57.7	7.1
	185 ($14C_1$)	0.988	14.9	0	0.00	0.00	0.00	502	60.2	508.1	60.9
	227	0.988	17.1	0	0.00	0.00	0.00	818	98.3	827.9	99.5
May 25	55 (2B)	0.988	6.2	2	0.27	2.02	0.27	77	8.9	77.9	9.0
	62 (5C)	0.988	10.2	0	0.00	0.00	0.00	213	24.9	215.6	25.2
	137	0.988	12.0	0	0.00	0.00	0.00	1613	188.8	1632.6	191.1
	134 (4D)	0.988	11.3	0	0.00	0.00	0.00	751	82.6	760.1	83.6
May 27	16 (7B)	0.768	9.6	0	0.00	0.00	0.00	22	2.9	22.3	2.9
	119	0.768	12.0	0	0.00	0.00	0.00	116	12.8	117.4	13.0
	142 ($14C_2$)	0.768	11.0	0	0.00	0.00	0.00	922	110.4	933.2	111.7
	208	0.768	17.7	0	0.00	0.00	0.00	2227	251.4	2254.0	254.5
June 1	96 (8C)	0.768	13.4	0	0.00	0.00	0.00	838	111.5	1091.2	145.2
	120 (7D)	0.768	12.2	0	0.00	0.00	0.00	290	35.7	377.6	46.5
	140 ($14C_3$)	0.768	12.3	0	0.00	0.00	0.00	374	47.8	487.0	62.2
	206	0.768	18.0	0	0.00	0.00	0.00	924	102.6	1203.1	133.6
June 2	79 (1B)	0.768	7.2	0	0.00	0.00	0.00	131	14.1	170.6	18.4
	65 (6C)	0.768	11.0	0	0.00	0.00	0.00	284	31.7	369.8	41.3
	161 ($14C_1$)	0.768	11.7	0	0.00	0.00	0.00	131	14.3	170.6	18.6
	159	0.768	13.0	0	0.00	0.00	0.00	216	23.7	281.2	30.9
June 7	20	0.768	7.0	19	2.49	24.74	3.24	343	47.5	446.6	61.9
	74 ($13B_3$)	0.768	5.9	4	0.45	5.20	0.58	607	79.9	790.4	104.0
	193	0.768	16.0	0	0.00	0.00	0.00	418	52.1	544.3	67.8
	213	0.768	17.4	0	0.00	0.00	0.00	392	42.3	510.4	55.0
June 8	56 (2B)	0.768	8.7	0	0.00	0.00	0.00	105	12.3	136.7	16.0
	85 (4C)	0.768	10.2	0	0.00	0.00	0.00	131	14.9	170.6	19.4
	158	0.768	12.6	0	0.00	0.00	0.00	150	15.8	195.3	20.6
	200	0.768	13.4	0	0.00	0.00	0.00	205	21.0	266.9	27.3
June 15	30 (2A)	0.768	6.4	0	0.00	0.00	0.00	46	5.4	59.9	7.0
	32 (3B)	0.768	7.8	0	0.00	0.00	0.00	35	4.5	45.6	5.8
	159	0.768	12.8	0	0.00	0.00	0.00	44	4.9	57.3	6.4
	178	0.768	13.1	0	0.00	0.00	0.00	96	9.8	125.0	12.8
June 16	15 (7B)	0.768	8.4	1	1.10	1.30	1.43	29	3.5	37.8	4.6
	24 (11B)	0.768	4.9	5	0.88	6.51	1.14	502	68.6	653.7	89.3
	208	0.768	18.6	0	0.00	0.00	0.00	106	11.0	138.0	14.3
	205	0.768	16.8	0	0.00	0.00	0.00	141	15.1	183.6	19.6
June 21	3A	0.768	5.8	9	1.24	11.72	1.61	74	9.1	96.4	11.8
	3B	0.768	8.1	4	0.48	5.21	0.62	47	5.2	61.2	6.8
	3C	0.768	10.1	0	0.00	0.00	0.00	50	5.3	65.1	6.9
	3D	0.768	11.0	1	0.13	1.30	0.17	37	4.1	48.2	5.3
June 22	9A	0.768	6.7	0	0.00	0.00	0.00	27	3.3	35.2	4.3
	9B	0.768	7.5	3	0.38	3.91	0.50	53	6.6	69.0	8.6
	9C	0.768	13.3	0	0.00	0.00	0.00	88	11.3	114.6	14.7
	9D	0.768	14.5	0	0.00	0.00	0.00	75	9.8	97.7	12.8
June 29	2A	0.768	6.2	21	2.87	27.34	3.74	99	11.5	128.9	15.0
	2B	0.768	7.8	6	0.97	7.81	1.26	89	10.5	115.9	13.7
	2C	0.768	10.1	0	0.00	0.00	0.00	54	6.3	70.3	8.1
	2D	0.768	10.8	0	0.00	0.00	0.00	75	8.7	97.7	11.3
June 30	6A	0.768	4.7	1	0.11	1.30	0.14	187	21.0	243.5	27.3
	6B	0.768	8.5	2	0.26	2.60	0.34	174	18.6	226.6	24.2
	6C	0.768	10.2	1	0.14	1.30	0.18	61	7.6	79.4	9.8
	6D	0.768	11.6	1	0.11	1.30	0.15	107	12.2	139.3	15.9

Continued .....

Appendix Table I. continued ...

DATE	LOCATION	EFFORT (km)	DEPTH (m)	SMALLMOUTH BASS Total No.	SMALLMOUTH BASS Total Wt. (kg)	SMALLMOUTH BASS CUE No/km	SMALLMOUTH BASS CUE kg/km	YELLOW PERCH Total No.	YELLOW PERCH Total Wt. (kg)	YELLOW PERCH CUE No/km	YELLOW PERCH CUE kg/km
July 5	$12B_1$	0.768	6.7	38	5.62	49.48	7.31	110	14.1	143.2	18.4
	$12B_2$	0.768	6.6	70	9.41	91.15	12.26	170	21.1	221.4	27.5
	$12B_3$	0.768	8.8	39	5.43	50.78	7.06	220	27.8	286.5	36.2
	12D	0.768	11.9	9	1.14	11.72	1.48	80	9.3	104.2	12.0
July 12	4A	0.768	5.3	4	0.61	5.21	0.79	91	10.6	118.5	13.8
	4B	0.768	7.9	3	0.43	3.91	0.56	61	6.9	79.4	8.9
	4C	0.768	10.1	0	0.00	0.00	0.00	18	1.9	23.4	2.5
	4D	0.768	10.8	0	0.00	0.00	0.00	29	3.2	37.8	4.1
July 13	10A	0.768	6.6	65	9.50	84.64	12.37	249	29.4	324.2	38.3
	10B	0.768	5.2	19	2.76	24.74	3.59	145	17.4	188.8	22.6
	10C	0.768	9.0	8	0.92	10.42	1.20	67	8.4	87.2	10.9
	10D	0.768	14.5	0	0.00	0.00	0.00	49	6.1	63.8	7.9
July 14	11A	0.768	4.4	21	3.29	27.34	4.28	274	32.6	356.8	42.5
	11B	0.768	5.3	14	1.99	18.23	2.60	145	17.5	188.8	22.8
	11C	0.768	10.8	1	0.13	1.30	0.16	73	9.1	95.1	11.9
	11D	0.768	13.6	1	0.16	1.30	0.21	88	10.9	114.6	14.2
July 20	7A	0.768	6.7	8	1.40	10.42	1.83	248	27.8	322.9	36.2
	7B	0.768	9.6	7	1.14	9.11	1.48	74	9.9	96.4	12.9
	7C	0.768	10.1	4	0.60	5.21	0.78	47	5.9	61.2	7.7
	7D	0.768	11.9	2	0.27	2.60	0.35	68	6.8	88.5	8.9
July 26	$13B_1$	0.768	7.0	3	0.54	3.91	0.70	253	31.8	329.4	41.4
	$13B_2$	0.768	6.7	10	1.60	13.02	2.09	424	53.3	552.1	69.4
	8C	0.768	10.5	12	1.75	15.63	2.28	126	15.2	164.1	19.7
	8D	0.768	14.0	3	0.44	5.21	0.57	84	10.3	109.4	13.4
July 27	8A	0.768	7.0	2	0.23	2.60	0.30	87	9.3	113.3	12.1
	8B	0.768	8.2	8	1.23	10.40	1.60	129	15.0	168.0	19.5
	$13B_3$	0.768	6.7	16	2.13	20.83	2.77	214	28.4	278.7	37.0
	13D	0.768	12.0	2	0.29	2.60	0.38	107	10.9	139.3	14.1
July 28	$14C_1$	0.768	8.1	20	2.79	26.04	3.63	466	59.3	606.8	77.2
	$14C_2$	0.768	11.1	7	1.12	9.11	1.46	66	7.8	85.9	10.1
	$14C_3$	0.768	9.6	19	3.16	24.74	4.11	273	32.8	355.5	42.6
	14B	0.768	7.0	77	10.97	100.26	14.28	1183	143.6	1540.4	186.9
Aug. 3	1A	0.768	5.5	6	0.78	7.81	1.02	488	64.2	635.4	83.6
	1B	0.768	6.6	4	0.58	5.21	0.76	629	75.1	819.0	97.8
	1C	0.768	9.3	7	1.00	9.11	1.30	53	6.2	69.0	8.1
	1D	0.768	9.9	6	1.01	7.81	1.32	37	4.3	48.2	5.6
Aug. 4	5A	0.768	4.6	13	2.20	16.93	2.87	1435	166.5	1868.5	216.8
	5B	0.768	6.1	18	2.66	23.44	3.47	390	46.7	507.8	60.8
	5C	0.768	10.7	2	0.39	2.60	0.51	89	11.0	115.9	14.3
	5D	0.768	11.3	4	0.66	5.21	0.85	100	12.1	130.0	15.8
Aug. 10	4A	0.768	6.6	2	0.31	2.60	0.40	842	98.4	1096.4	128.1
	4B	0.768	7.9	0	0.00	0.00	0.00	210	25.9	273.4	33.7
	4C	0.768	9.6	2	0.37	2.60	0.49	204	24.6	265.6	32.0
	4D	0.768	10.1	0	0.00	0.00	0.00	106	12.4	138.0	16.1
Aug. 11	6A	0.768	3.4	7	1.20	9.11	1.56	984	115.6	1281.3	150.5
	6B	0.768	5.8	11	1.51	14.32	1.96	851	99.7	1108.1	129.8
	6C	0.768	9.8	7	1.08	9.11	1.41	634	78.2	825.5	101.8
	6D	0.768	11.0	2	0.30	2.60	0.39	153	19.6	199.2	25.5
Aug. 23	2A	0.768	4.7	11	0.70	14.32	2.21	362	44.2	471.4	57.6
	2B	0.768	5.9	32	5.08	41.67	6.61	270	32.7	351.6	42.6
	2C	0.768	10.5	4	1.35	5.21	1.75	822	100.8	1070.3	131.2
	2D	0.768	10.7	5	0.92	6.51	1.20	1002	127.9	1304.7	166.5
Aug. 25	5A	0.768	3.2	1	0.13	1.30	0.17	180	22.9	234.4	29.8
	5B	0.768	5.3	5	0.85	6.51	1.10	132	17.1	171.9	22.3
	5C	0.768	9.4	28	4.15	36.46	5.41	309	38.8	402.3	50.5
	5D	0.768	11.1	40	6.55	52.08	8.53	677	84.1	881.5	109.5

Continued .....

Appendix Table I. continued ...

DATE	LOCATION	EFFORT (km)	DEPTH (m)	SMALLMOUTH BASS Total No.	SMALLMOUTH BASS Total Wt. (kg)	SMALLMOUTH BASS CUE No/km	SMALLMOUTH BASS CUE kg/km	YELLOW PERCH Total No.	YELLOW PERCH Total Wt. (kg)	YELLOW PERCH CUE No/km	YELLOW PERCH CUE kg/km
Aug. 30	7A	0.768	6.6	2	0.24	2.60	0.32	217	24.8	282.6	32.2
	7B	0.768	7.8	1	0.13	1.30	0.17	282	34.8	367.2	45.3
	7C	0.768	9.9	8	1.35	10.42	1.76	1367	170.8	1779.9	222.3
	7D	0.768	11.3	0	0.00	0.00	0.00	1334	173.1	1737.0	225.4
Aug. 31	$12B_1$	0.768	7.0	8	1.07	10.42	1.39	159	21.2	207.0	27.6
	$12B_2$	0.768	7.9	52	7.05	67.71	9.18	855	112.3	1113.3	146.3
	$12B_3$	0.768	8.5	41	5.48	53.39	7.13	910	127.5	1184.9	166.0
	12D	0.768	11.6	10	1.33	13.02	1.73	899	122.7	1170.6	159.8
Sept. 7	8A	0.585	7.6	7	1.10	11.97	1.88	168	20.7	287.2	35.4
	8B	0.585	7.2	5	0.68	8.55	1.17	340	43.8	581.2	74.9
	8C	0.585	11.6	27	4.13	46.15	7.06	309	44.5	528.2	76.1
	8D	0.585	12.8	4	0.59	6.84	1.01	1036	146.6	1770.9	250.6
Sept. 8	1A	0.585	5.6	4	1.19	6.84	2.04	212	25.3	362.4	43.3
	1B	0.585	6.4	5	0.64	8.55	1.09	38	5.1	65.0	9.1
	1C	0.585	9.3	22	3.17	37.61	5.42	327	43.4	559.0	74.1
	1D	0.585	9.9	5	1.24	8.55	2.11	377	49.9	644.4	85.4
Sept. 13	$13B_1$	0.585	4.9	7	0.81	11.97	1.41	37	6.1	63.3	10.4
	$13B_2$	0.585	6.4	15	2.05	25.64	3.50	110	17.9	188.0	30.5
	$13B_3$	0.585	6.2	23	3.92	54.70	6.70	94	14.7	160.7	25.1
	13D	0.585	11.4	30	4.05	51.28	6.93	329	44.0	562.4	75.2
Sept. 22	9A	0.585	5.6	4	0.63	6.84	1.08	123	17.3	210.3	29.6
	9B	0.585	7.2	2	0.28	3.42	0.47	114	15.9	194.9	27.1
	9C	0.585	5.9	28	3.52	47.86	6.01	215	32.5	367.5	55.6
Sept. 27	10A	0.585	5.3	8	1.12	13.68	1.91	202	29.3	345.3	50.1
	10B	0.585	4.9	9	1.23	13.68	1.88	64	9.3	109.4	15.9
	10C	0.585	8.2	20	2.62	34.19	4.48	111	16.1	189.7	27.6
	10D	0.585	13.3	50	6.32	85.47	10.97	879	127.6	1502.6	218.2
Oct. 4	3A	0.585	5.0	2	0.21	3.42	0.36	59	7.1	100.9	12.1
	3B	0.585	6.7	3	0.65	5.13	1.11	77	9.7	131.6	16.6
	3C	0.585	9.8	16	2.11	27.35	3.60	184	19.1	314.5	32.7
	3D	0.585	10.4	3	0.43	5.13	0.73	396	52.7	676.9	90.1
Oct. 6	2A	0.585	4.7	0	0.00	0.00	0.00	83	10.2	141.9	17.4
	2B	0.585	6.6	0	0.00	0.00	0.00	57	7.3	97.4	12.6
	2C	0.585	9.9	14	2.02	23.93	3.45	30	4.5	51.3	7.7
	2D	0.585	10.7	2	1.32	3.42	2.26	67	9.5	114.5	16.2
Oct. 20	4A	0.585	4.7	1	0.11	1.71	0.18	9	1.1	15.4	1.9
	4B	0.585	7.3	6	0.85	10.26	1.45	50	6.7	85.5	11.4
	4C	0.585	10.1	1	0.09	1.71	0.15	116	16.2	198.3	27.7
	4D	0.585	10.7	0	0.00	0.00	0.00	290	38.7	495.7	66.2
Nov. 3	$14C_1$	0.585	8.8	0	0.00	0.00	0.00	20	2.8	34.2	4.8
	$14C_2$	0.585	12.0	0	0.00	0.00	0.00	3	1.1	5.1	1.9
	$14C_3$	0.585	12.2	0	0.00	0.00	0.00	24	3.6	41.0	6.2
	14B	0.585	10.8	2	0.69	3.42	1.17	28	4.4	47.9	7.5
POOLED LOCATIONS: (May - Nov.)		115.275		1240	183.39	10.76	1.59	46125	5699.6	400.1	49.4
POOLED LOCATIONS: (July - Sept.)	A	11.556		165	24.63	14.28	2.13	6162	738.9	533.2	63.9
	B	20.991		550	77.14	26.20	3.67	8613	1092.6	410.3	52.1
	C	13.860		226	33.60	16.31	2.42	5576	707.3	402.3	51.0
	D	13.860		174	25.37	12.55	1.83	7434	981.8	536.4	70.8
	All	60.267		1115	160.74	18.50	2.67	27785	3520.6	461.0	58.4

APPENDIX TABLE II. SAMPLE CALCULATIONS

A. Estimated catches for July 1 - September 30, areas combined, using 1987 effort levels.

1. CUE of smallmouth bass. $\hat{R} = 9.2$

2. Total reported commercial effort, areas combined = 825.396 km

3. Estimated smallmouth bass catch. areas combined
   = 9.2 x 825.396
   = 7593.64

4. Std. Error of estimated catch $S(\hat{Y}_R) = N \sqrt{\frac{\Sigma (y_i - Rx_i)}{n(n-1)}} \cdot \sqrt{1 - \emptyset}$

where: N = number of reported fishing occasions between July 1 and September 30
= 317

n = number of samples
= 25

$\emptyset$ = sampling fraction
= n/N
= 25/317

y_i = smallmouth bass catch from i^{th} samples

x_i = effort expended in i^{th} samples

$$S(\hat{Y}_R) = 317 \sqrt{(15435.012/600)} \cdot \sqrt{1 - (25/317)}$$
$$= 381 \times 5.07198 \times 0.95976$$
$$= 1543.119$$

5. 95% confidence limits on pooled estimated catch (assume Z)
   = 1543.119 x 1.96
   = 3024.51

6. Pooled estimated smallmouth bass catch = 7,594 ± 3025 bass

FISHERMEN

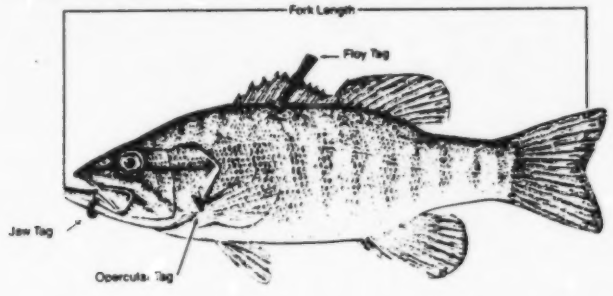
The **LAKE ERIE FISHERIES ASSESSMENT UNIT** is tagging Smallmouth Bass in Long Point Bay in an effort to learn the movement patterns of Bass in the Bay and Lake Erie.

There could be one of 3 types of tags on a bass:

(a) Floy Tags: cylindrical in shape, about 4 cm long, and flourescent pink in colour. The tag is attached to the fish beside the dorsal fins, the large fins on the top of the fish

(b) Metal Jaw Tags: small metal tags wrapped around the lower jaw

(c) Metal Opercular Tags: attached to one of the gill covers



If you catch a fish with a tag, you can help us by returning the tag or the tagged fish.

If you give us the tag we will pay you $3.00

If you give us the tag and the fish, we will pay you $5.00

When you give us the tag or tagged fish, include your name, address and phone number; date caught; where caught; method caught and fork length (mm).

SEND TAGS TO:

Lake Erie Fisheries
Assessment Unit
P. O. Box 429
Port Dover, Ontario
N0A 1N0

Leave Fish With:

Lake Erie Fisheries Assessment Unit office at the Port Dover Boat Basin, any Ministry of Natural Resources office, or any Long Point Bay marina.

Bonus Prize

for fishermen who give us tagged fish.

Commercial Fishermen

Tagged fish taken by commercial gear qualify for a draw for a floater jacket. The draw will be held in December.

Anglers

Tagged fish taken by angling gear qualify for a draw for a new rod and reel. The draw will be held in December.

Ministry of Natural Resources
Ontario

Hon. Vincent G. Kerrio
Minister

George Taugh
Deputy Minister

Appendix Figure I.

Appendix Figure II. Locations of commercial gillnet straps examined by OMNR staff between May 10 and May 27 during the On-Board Survey. Numbers beside each strap refer to Fisherman No. in Tables 3 and 4. Single points denote location(s) of strap(s) where LORAN-C was not functioning.

Appendix Figure III. Locations of commercial gillnet straps examined by OMNR staff between June 1 and June 23 during the On-Board Survey. Numbers beside each strap refer to Fisherman No. in Tables 3 and 4. Single point denotes location of strap where LORAN-C was not functioning.

Appendix Figure IV. Locations of commercial gillnet straps examined by OMNR staff between July 7 and August 30 during the On-Board Survey. Numbers beside each strap refer to Fisherman No. in Tables 3 and 4.

Appendix Figure V. Locations of commercial gillnet straps examined by OMNR staff between September 1 and October 6 during the On-Board Survey. Numbers beside each strap refer to Fisherman No. in Tables 3 and 4.

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